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DISPOSAL OF BRIDGE PAINT RESIDUE





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**Research Report
KTC-05-40/SPR-292-05-1F
Disposal of Bridge Paint Residue**

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College of Engineering
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in cooperation with

**Kentucky Transportation Cabinet
Commonwealth of Kentucky**

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EXECUTIVE SUMMARY

Background

Many KYTC steel bridges currently possess lead paint. When it is removed during maintenance painting operations lead paint residue is generated. The Resource Conservation and Recovery Act (RCRA) regulates lead as a characteristic hazardous material. Under certain conditions RCRA considers the lead paint residue to be hazardous. Current KYTC practice has been to dispose of all lead paint residues as a hazardous waste. This requires KYTC to obtain a hazardous waste generation permit and an EPA ID number for each site. RCRA and its amendments also impact KYTC waste generation, storage and disposal operations. Disposal operations require hazardous wastes to be transported to a licensed treatment, storage and disposal (TSD) facility. Each shipment of that waste must be manifested and hauled by a licensed hazardous waste transporter. KYTC must receive copies of the manifests showing that the material was received by the TSD facility and properly treated and disposed. KYTC must maintain those records for many years and pay fees for hazardous waste permitting and waste generation. KYTC also bears in perpetuity liability for its hazardous wastes regardless of their acceptance, treatment and disposal by a private landfill.

KYTC practices for disposing of hazardous waste from maintenance painting operations have worked well and the associated costs have been deemed acceptable. However KYTC has established a goal to minimize waste generation, especially hazardous wastes. Maintenance painting operations are probably one of the largest sources of KYTC hazardous waste generation. This study was conducted to investigate options for addressing the KYTC goals relative to the generation of lead paint residue which is currently deemed a hazardous waste.

Review of laws, regulations and memorandums of understanding indicated two options for reducing generation of hazardous waste applicable to maintenance painting operations: 1) recycling and 2) in-situ stabilization. RCRA addresses recycling and limits options for using this method to dispose of hazardous wastes. At the time this study was conducted only one firm in the U.S., the Doe Run Company, would accept lead paint residue for recycling. That residue must include either spent silica sand or steel grit abrasives to permit recycling/reuse as a commercial substitute. Those materials are required for slag in lead smelting. The low percentage of lead in paint (usually less than 1 percent) is insufficient for practical recycling and RCRA prohibits “sham recycling” that serves no productive purpose. Significant research had been conducted by state highway agencies and other government organizations to reduce or eliminate hazardous waste generation from bridge maintenance painting. Use of proprietary chemicals to achieve in-situ stabilization of lead paint residue (and thereby render it a non-hazardous waste) is a viable option. Typically those chemicals are applied over the existing paint prior to their removal or pre-blended with expendable abrasives to produce a lead paint residue which is categorized as non-hazardous under RCRA. The residue must be subject to special sampling and testing to make that determination (called the EPA Toxicity Characteristic Leaching Procedure or TCLP test). If a waste is determined to be non-hazardous, it can be disposed of in a subtitle D contained landfill in Kentucky. Currently all lead paint residue classified as hazardous is shipped out of state to a TSD facility. Both recycling and in-situ stabilization offer additional benefits. By employing them RCRA requirements related to permitting, manifesting, transport, disposal and recordkeeping are avoided, simplifying the waste disposal process.

Based on a preliminary review by KTC researchers, KYTC officials conducted an experimental maintenance painting project. It addressed the use of in-situ stabilization admixtures and recycling to limit the amount of hazardous waste generation from lead paint residue. The project entailed four bridges in Warren, Allen and Butler counties. Two bridges were to use different proprietary stabilization chemicals pre-blended with expendable abrasives to generate lead paint residue that would not be hazardous waste. The other two bridges were to be blast cleaned using recyclable steel grit with the intent of recycling the lead paint residue. After a pre-bid meeting, the project was let on January 21, 2005 and awarded to Vimas Painting Co. of Campbell, OH for \$894,422 (\$5.88/ft²). The Engineer's Estimate was \$1,232,490. Four bids were submitted ranging from \$894,422 to \$1,625,935.

Prior to the onset of work the contractor requested that KYTC officials consider substituting recyclable steel grit for the pre-blended expendable grit normally used in stabilization operations. He had vacuum/recycling units on site and stated that the use of recyclable grit would significantly reduce the amount of solid waste generated in blast cleaning operations. Letters of endorsement for the change were provided by the manufacturers of the stabilization chemicals and a change order was issued to allow the use of recyclable grit on those two bridges.

Work on the project began in May, 2005. The recycling operations went without incident. From 77,800 ft² of painted steel, 49,375 lbs of lead paint residue was produced. It was recycled for \$12,428 (\$503 per ton) excluding costs for transporting containers and amortization of costs for the contractor's vacuum/recycling truck.

Problems were encountered on the stabilization phase of the project. Those problems were related to: 1) an ineffective means of dosing the stabilizer chemicals into the recyclable steel grit bin on the vacuum/recycling truck, 2) bags of one stabilization chemical become wet causing the material to clump up, and 3) the vacuum/recycling unit employed possessed 5 waste collection points and apparently separated the stabilizer from the lead paint residue in the grit recycling process. The sampling procedures employed also may have inadequate. As a consequence of those factors some of the lead paint residue tested hazardous. The contractor subsequently disposed of the entire resulting stabilizer/lead paint residue from those two bridges as hazardous waste. From 74,200 ft² of painted steel on those bridges, 26,200 lbs of stabilizer/lead paint residue was produced. It was disposed as a hazardous waste for a cost of about \$7,500 excluding costs for transporting containers and amortization of costs for the contractor's vacuum/recycling truck.

Recommendations

Based upon this experimental project, the following recommendations are provided:

- Recycling is the best option for addressing KYTC goals pertaining to reducing both hazardous and solid wastes and should be employed on most future KYTC maintenance painting projects.
- Recyclable steel grit needs to be specified on total removal projects to permit recycling of the lead paint residue as a commercial substitute.
- Future transport of hazardous materials should be by common or contractor carriers licensed to ship hazardous materials in the states through which the waste is transported.
- KYTC may still need to obtain a conditionally exempt small quantity hazardous waste generator permit to dispose of miscellaneous wastes. Doe Run may be able to accept some or all of those wastes.

- KYTC inspectors must be diligent in preventing co-mingling of wastes with the lead paint residue or the Doe Run smelter will refuse to accept contaminated residue for recycling.
- A plan must be provided to deal with that contingency. KYTC is responsible for the material and if it is rejected by Doe Run, it may constitute a hazardous waste.
- Another experimental effort is needed to investigate the use in-situ stabilization chemicals with recyclable grit to convert hazardous waste to solid waste for local disposal in a contained landfill. As shown in Cost Estimate 5 of Appendix 2, proper selection of disposal options and successful stabilization treatment can provide an economically viable alternative to recycling or hazardous waste disposal.

INTRODUCTION

Background

Many KYTC steel bridges possess lead coatings that were applied 20 or more years before the hazards of lead were well appreciated and regulated. Since then, laws and regulations have eliminated the continued use of significant amounts of lead in structural coatings. The removal of existing lead coatings on bridges has posed a significant concern to KYTC officials for a variety of reasons that extend beyond compliance with laws and regulations impacting lead paint removal, residue collection and subsequently treatment and disposal.

Throughout the 1990s, and into the early 2000s KYTC officials sought to limit the amount of lead paint residue generated by bridge maintenance painting operations. They employed overcoating in maintenance painting operations and experimented with the use of noninvasive methods of surface preparation for overcoating to further reduce the disturbance of existing lead paint. When it became evident that significant mechanical surface preparation and pressure washing was needed to properly prepare substrates for overcoating, KYTC officials acknowledged that the resulting lead paint residue would need to be collected and properly disposed of in accordance with applicable regulations. Due to the widespread presence of lead in existing bridge coatings; it was likely that the residue would need to be managed as a hazardous waste on most projects.

As overcoating tended to generate only limited amounts of waste KYTC officials decided to eliminate the need for on-site waste sampling and laboratory characterization by declaring all lead paint residue to be hazardous. In some respects this simplified the waste disposal process and helped insure proper on-site collection, handling and storage by paint contractors. Few problems were encountered relative to hazardous wastes during this period. However, it resulted in the generation of hazardous wastes on the majority of KYTC bridge maintenance painting projects.

In the period of 2002-03, there was a noticeable shift in pricing for bridge maintenance painting projects. Overcoating costs rose and total removal (abrasive blasting) costs decreased. In part, this related to the increased contractor familiarity in dealing with hazardous wastes. It also related to the amortization of their equipment used for total removal (including abrasive recycling equipment). This shift in pricing reduced the life-cycle costs of total removal projects. While first costs remained higher to overcoating, the desirability of eliminating lead paint from bridges was attractive to KYTC officials who began to specify total removal on many projects.

Concurrent with this change in practice was the realization that more hazardous wastes would be generated. While that factor did not lead to appreciable increases in project costs, it prompted several concerns. There were no treatment/storage/disposal (TSD) facilities in Kentucky that handled this type of hazardous waste. Consequently, the bulk of KYTC lead paint residue (waste) was transported to Michigan by a TSD firm, treated to stabilize the waste and render it non-hazardous, and then disposed of in one of several contained (Subtitle D) landfills located in Michigan. One concern related KYTC's in-perpetuity liability for those wastes under the Superfund Law. Another concern related to KYTC's goal of eliminating or at least minimizing the generation and disposal of hazardous wastes (and solid wastes). Those goals conform to the intentions of federal laws and regulations dealing with wastes that seek to reduce the hazards posed by wastes and the amounts of those wastes being disposed by landfilling.

Two options existed for addressing those situations – 1) recycling the paint residue and 2) in-situ treatment with waste stabilizers to change the residue from a hazardous to a non-hazardous (solid) waste for disposal purposes. Recycling eliminates wasting the material and avoids regulation under certain federal and state laws/regulations. That eliminates/minimizes some of the “in-perpetuity” concerns. From an ecological standpoint, it supports the practice of sustainability, breaking the “take, make and waste” cycle in favor of the more desirable “borrow, use and return” alternative. Lead has several commercial uses which continually require additional material for new products (e.g. batteries). Recycling is an environmentally desirable means of addressing that need. Recycling can be applied to either overcoating or total removal operations. For total removal operations recyclable steel/iron grit is an effective practice currently in use by most painting contractors that helps reduce the amount of lead paint residue generated compared to expendable abrasives. As noted below the use of steel/iron grit can be used to promote/justify recycling.

In-situ stabilization still requires wasting of the paint residue. The process is similar in its approach to rendering lead paint residue non-hazardous as performed by a commercial TSD firm, except the stabilization operation occurs at the job site and the level of treatment may not need to be as rigorous. Stabilization chemicals are applied to the lead paint/paint residue either prior to, during, and subsequent to removing the coating from a bridge. Typically the chemicals bond to the resulting residue and effectively render it non-hazardous under federal and state waste disposal regulations. Thereafter it can be disposed locally at a contained (Subtitle D) landfill. The resulting waste taken off-site for disposal is considered non-hazardous avoiding many regulatory restrictions. Disposal costs may be reduced significantly. As the treated waste sampling and testing can be done under KYTC supervision the agency should have greater assurance that the waste was properly treated than if it was sent out of state as a hazardous waste. In-situ stabilization is more practical for total removal paint operations. However certain stabilization methods could be applied to overcoating wastes. For total removal operations expendable or recyclable abrasives may be employed depending upon the type and quantity of chemical stabilizers employed.

This study, KYSPR 05-292 “Disposal of Bridge Paint Debris”, was initiated to investigate the potential for KYTC adoption of both recycling and in-situ stabilization of lead paint residue from maintenance painting operations. While this work had some consequences nationally the need to address Kentucky environmental regulations and interpretations of federal regulations made this study more state-specific in terms of final applicability. In the formation of the Study Advisory Committee representatives were solicited from the Kentucky Environmental and Public Protection Cabinet to provide guidance on permissible environmental actions by KYTC regarding the use of both recycling and in-situ stabilization. That guidance was vital enabling the study to move forward and providing the necessary bounds for future KYTC actions regarding recycling/disposal of lead paint residue.

Study Objectives/Tasks

The study objectives were approved by the Study Advisory Committee. Those were to:

1. Review hazardous waste disposal actions for lead paint debris/residue from blast cleaning operations on recent KYTC bridge maintenance paint projects identifying important factors including permitting requirements, quantities of hazardous material disposed, cost, type of blast media, hazardous material test results, and name/location of disposal facilities.

2. Identify laws and regulations impacting hazardous waste disposal and recycling. Determine the impact of recycling bridge paint debris and assess whether it is a practical alternative to hazardous waste treatment and disposal. Identify recycling facilities that will accept hazardous paint debris and determine their capacities/costs.
3. Investigate commercially available additives for stabilizing paint debris that is considered hazardous waste. Review current regulations/factors impacting the use of those materials and identify commercial sources of stabilization material.
4. Assist in the development of experimental projects incorporating recycling and hazardous waste stabilization. Monitor the resulting projects and identify problems/benefits of using those approaches.
5. Prepare recommended practices for identifying the appropriate methods for disposing/eliminating hazardous waste (lead paint debris) based on work addressing the previous subjects. Recommended practices would include evaluation methods for assessing the amount of paint on bridges, the amount of hazardous waste generated and the best means of limiting the hazardous waste stream by use of recyclable abrasives, recycling, stabilization or a combination of those methods.

To address those goals, KTC researchers were assigned five tasks. Those were to:

Task 1. Review the current KYTC hazardous waste disposal process from blast cleaning operations on KYTC bridge maintenance paint projects. Contact pertinent personnel in the KYTC Division of Environmental Analysis and the Environment and Public Protection Cabinet's Division of Waste Management. Identify recent hazardous waste disposal steps for lead paint debris including permitting requirements, quantities of hazardous material disposed, related costs, type(s) of blast media employed, hazardous material test results, and name/location of disposal facilities used by painting contractors.

Task 2. Obtain and review current laws and regulations impacting hazardous waste disposal and recycling. Identify regulations that affect recycling and determine their impact on the potential KYTC use of recycling in lieu of hazardous waste treatment and disposal (e.g. Do recycled wastes need to be manifested and tracked?, Do they need to be hauled by a licensed hazardous waste transporter?, etc.). Identify recycling facilities that will process lead paint debris. Determine the feasibility of using those facilities to recycle paint debris from KYTC projects.

Task 3. Identify commercially available additives for stabilizing paint debris that is considered hazardous waste. Determine how those are specified/incorporated into actual bridge painting projects. Review current regulations/factors impacting the use of those materials and identify disposal facilities that will accept treated paint debris containing lead.

Task 4. Work with KYTC officials to develop experimental bridge maintenance painting projects incorporating recycling and hazardous waste stabilization. Monitor the resulting projects and identify problems/benefits of using those approaches.

Task 5. Provide recommended practices for eliminating hazardous waste (lead paint residue).

WORK ADDRESSING STUDY TASKS

Task 1. Review the Current KYTC Hazardous Waste Disposal Process

Current KYTC waste disposal practice entails designating all paint residues from bridges with existing lead paint as hazardous. When a bridge maintenance painting project is let for one of

those bridges KYTC Division of Environmental Analysis (DEA) officials will identify the location(s) of structures where waste generation will occur and the types and amounts of hazardous waste(s) to be generated. They will file a Registration of Hazardous Waste Activity with the Division of Waste Management (of the Kentucky Environment and Public Protection Cabinet or EEPC) to obtain an EPA Identification Number for the project. That number is to be used in the hazardous waste management for the specific project. That number must be renewed annually. Also, a modified Registration of Hazardous Waste Activity must be filed if a change occurs – 1) a waste stream is removed, 2) the contact person changes or 3) the generator status changes.

For maintenance painting projects a contractor is required to have a “Competent Person for Lead Abatement” as defined in OSHA 1926.62 on site during any operations that disturb lead. The contractor must use impermeable containment – SSPC Guide 6 – Classification Class 2A with a re-sealable entryway. Airborne dust, generated by the blasting process and fans, must not leak from the containment in sufficient quantities to be visible. The paint residue must be collected daily. If the containment is dismantled, the inside walls must be cleaned to remove any adherent dust. The paint residue/dust is a hazardous waste. It is usually placed in DOT-standard containers (e.g. 55-gallon drums) and taken to a temporary storage site.

The paint residue must be stored separate from other hazardous waste. KYTC usually designates a temporary waste storage facility on its property. The contractor is required to erect a secured chain-link fence enclosure at that site to temporarily secure the stored paint residue. An impermeable liner is placed upon the ground in the enclosure and the containers are placed on skids (unless roll-offs are used). The storage containers and enclosure must be appropriately marked to indicate that they contain hazardous waste.

The contractor is allowed to store the paint residue in a container for up to 75 days after it is first filled. The DEA will inspect the storage site weekly to ascertain compliance with regulations. Within the 75-day storage window it must be manifested and transported to a permitted/licensed treatment-storage-disposal (TSD) facility using a licensed hazardous waste transporter. This temporary storage requirement is set by KYTC and is less than the EPA-specified maximum date. The contractor is subject to \$2,000 per day per drum or \$8,000 per cubic yard per day penalty by KYTC for exceeding that storage period. The hazardous waste is delivered with manifests to the TSD facility. The hazardous waste is then treated to render it non-hazardous and is subsequently disposed of in a suitable permitted landfill.

The contractor receives a copy of the manifest indicating that it has been properly treated and land-filled. At the end of the project, the contractor submits the manifests to the designated DEA contact. Thereafter, the DEA must file an annual report on the amount of hazardous waste generated and pay a small fee (Assessment Return) to the EPPC based upon that amount.

The use of total removal was investigated in a prior study and report documenting many of these issues was prepared by KTC researchers (1). The Society for Protective Coatings (SSPC) has prepared guides for containing hazardous paint debris generated during blast cleaning operations and disposing of the hazardous waste residue generated by those operations (2, 3). The SSPC also has published a compendium handbook addressing most issues related to the generation and disposal of lead paint residue (4).

Task 2. Current laws and regulations addressing hazardous waste disposal, on-site treatment, and recycling

Hazardous Waste Disposal

At the Federal level, hazardous waste management is regulated by the U.S. Environmental Protection Agency (USEPA). Regulations enacted by the USEPA are based upon laws passed by Congress. Those are contained in sections of the U.S. Code of Federal Regulations. Federal laws addressing hazardous waste management are primarily from the 1976 Resource Conservation and Recovery Act (RCRA) and the subsequent 1984 Hazardous and Solid Waste Amendments (HSWA). The RCRA regulations are contained in 40 CFR 240 through 280. RCRA is divided into 10 sections (A-J). Regulations impacting hazardous waste are contained in Subtitle C Hazardous Waste Management (40 CFR 260, Appendix 1). This Section regulates hazardous waste generators, transporters, and owners of hazardous waste TSD facilities. RCRA and HSWA are intended to regulate wastes from generation to disposal (“cradle to grave”) ensuring that disposal is effective and permanent so there will be no releases of disposed hazardous waste back into the environment. The most important parts of RCRA related to hazardous wastes generated by bridge maintenance painting operations are:

Part 261	Identification and Listing of Hazardous Wastes
Part 262	Standards Applicable to Generators of Hazardous Wastes
Part 268	Land Disposal Restrictions

To be a hazardous waste a material must meet the definition of a solid waste (40 CFR 261.2(a)(1)) and be hazardous by listing or characteristic. A solid waste is any material that is discarded. Those materials are categorized as 1) spent materials, 2) sludges, 3) by-products, 4) commercial chemical products, and 5) scrap metals. A second determination is necessary for hazardous wastes. Wastes considered harmful to health or the environment are considered hazardous waste.

Listed wastes are related to specific or non-specific sources typically associated with manufacturing. Those are listed under 40 CFR 261.31 through 40 CFR 261.33. Listed wastes are considered hazardous regardless of concentration. Characteristic wastes are not specifically associated with any manufacturing process. RCRA lists specific wastes by a number denoting whether the waste is listed or characteristic – Characteristic wastes having a “D” prefix and a specific hazard (i.e. ignitable - D001, corrosive - D002, reactive – D003, and EP-toxic – (D004-D0017). Those are defined under 40 CFR 261.20 through 40 CFR 261.24. “EP” signifies the term “Extraction Procedure” which is explained below. Lead classified as an EP-toxic waste. Its specific RCRA waste number is D008. It is the primary hazardous constituent in older alkyd bridge paints. Lead served a variety of roles in paints acting as a dryer, a color stabilizer and an anti-corrosive pigment. Lead pigments include red lead (lead orthoplumbate), blue lead, lead sub-oxide, basic lead silico-chromate, and zinc yellow (5). Other regulated heavy metals such as barium, arsenic, cadmium and chromium may also be present. However they are usually found in non-regulated quantities in the old KYTC-specification alkyd paints. A waste that is comprised of a mixture including a characteristic waste may or may not be a hazardous waste. In the case of paint residue consisting of lead paint chips mixed with spent abrasive, the level of EP-toxicity determines whether the mixture (the paint residue) would be a hazardous waste.

Under RCRA Subtitle C the USEPA has assigned specific responsibilities for three parties involved in hazardous waste from generation through disposal: the generator, the shipper

(transporter), and the TSD facility (6). The painting contractor is considered a co-generator and has some liability in this process; however the facility owner is considered the primary generator and has the ultimate responsibility for the waste.

RCRA regulates lead paint residue as a hazardous waste based upon its leachable lead concentration in the paint residue that is to be wasted (disposed of) in 40 CFR 262.11. A waste determination must be made from the collected residue in temporary storage. This entails specific sampling requirements to collect representative samples for subsequent testing and analyses (SW-846, the USEPA Solid Waste Sampling Guidance Manual). The sampling is statistically based and the methods for sampling, the sample size, and the number of samples taken need to be both correlated with residue sampled (based upon generation/quantity variables) and the test/analytical results (7). At a minimum, four samples weighing about a pound each should be taken. The testing is to be conducted using EPA Method 1311: Toxicity Characteristic Leaching Procedure (contained in SW-846). That is the extraction procedure alluded to under the EP-toxic designation and is intended to replicate the susceptibility of the lead to leach out of the disposed (land filled) waste and enter the groundwater. Under this method, multiple samples are ground to less than a 3/8-inch sieve size and tumbled in an acetic acid solution for 18 hours. The samples are micro-filtered and the extracts subjected to elemental analyses to measure the concentration of lead. If the leachable lead concentration analyses exceed 5.0 mg/L on a statistically significant basis, the waste is considered hazardous. If not, the wastes fall under RCRA Subtitle D governing non-hazardous solid wastes (40 CFR 257). They may be disposed of as non-hazardous though restricted wastes in a RCRA Subtitle D contained landfill (40 CFR 268). The EPA Regional Administrator must be informed of such disposals including lead-bearing paint residues that are non-hazardous naturally or as a consequence of treatment (e.g. in-situ stabilization).

The original rationale behind the 5 mg/L requirement was based upon the previous drinking water standard of 0.05 mg/L. If landfilled lead residue was subject to exposed to rain water permeating through the landfill cap over time the residue might react with the water (especially if it was acidic) and dissolve the lead into the resulting leachate. This leachate might seep through the land fill liner and enter the groundwater. Assuming a 100:1 dilution of the leachate, the resulting impact on the groundwater would be presumed to fall below the drinking water standard. Since that original model was developed the allowable lead concentration in drinking water has been lowered to 0.0015 mg/L without an equivalent adjustment in the EP Toxicity regulation for lead-bearing solid wastes.

Generator requirements for hazardous waste disposal are based on the amount of hazardous waste created over time or the amount stored on site at any one time. Large Quantity Generators create over 2,200 lb. per month or store 6,000 lb. or more on site at any one time. Small Quantity Generators generate between 220-2,200 lb. per month or store less than 6,000 lb. at any one time. Conditionally Exempt Small Quantity Generators create less than 220 lb. per month or store less than 2,200 lb. at any one time. RCRA requirements for Large and Small Quantity Generators fall under 40 CFR 262 for identifying the hazardous waste, permitting, manifesting, packaging and labeling, container requirements, contingency plans and training, waste accumulation times and recordkeeping and reporting. Conditionally Exempt Generators do not need to meet all those requirements, but must ensure that the hazardous waste is properly disposed of.

For off-site transportation, hazardous special waste transporters must be employed that meet the requirements set forth in 40 CFR 263. The transporter must obtain the EPA identification

number for the waste site, comply with the manifest system and take remedial action if a release occurs in transit. Transporters must also comply with the requirements of each state through which they travel.

Hazardous waste TSD facilities are governed by the requirements of 40 CFR 264 and 265. Typically hazardous paint residues are wasted by land filling. The Land Disposal Restrictions of 40 CFR 268 prohibit the direct land filling of a hazardous material. It must be treated prior to land filling to render it non-hazardous under 40 CFR 268 Subpart B Schedule for Land Disposal Prohibition and Establishment of Treatment Standards. Lead is specifically covered under 40 CFR 268.35. The Universal Treatment Standard for hazardous lead wastes is below 0.75 mg/L. Potential treatments include incineration and stabilization. Stabilization treatments are commonly used for hazardous lead paint residues. Those include Portland cement and lime/pozzolans that reduce the leachability of the metal in its inorganic or organic states. After stabilization below the treatment standard, the waste paint residue may be disposed in a hazardous (Subtitle C) or non-hazardous (Subtitle D) landfill.

State Regulation of Hazardous/Solid Waste Disposal

RCRA encourages states to assume some of the federal responsibilities for operating their own waste programs. Kentucky, along with most other states has enacted regulations regarding production, storage, transport, treatment or disposal of hazardous waste. The laws related to this are contained in the Kentucky Revised Statutes, Chapter 224 Environmental Protection, Subchapter 46 Hazardous Waste and Subchapter 43 Solid Waste. Regulatory authority is vested in the Kentucky Environmental and Public Protection Cabinet Division of Waste Management under Title 401 Chapters 31 through 40. Those are:

Chapter 31	Identification and Listing of Hazardous Waste
Chapter 32	Standards Applicable to Generators of Hazardous Waste
Chapter 33	Standards Applicable to Transporters of Hazardous Waste
Chapter 34	Standards for Owners and Operators of Hazardous Waste Storage, Treatment and Disposal Facilities
Chapter 35	Interim Status Standards for Owners and Operators of Hazardous Waste Storage, Treatment and Disposal
Chapter 36	Standards for Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste
Chapter 37	Land Disposal Restrictions
Chapter 38	Hazardous Waste Permitting Process
Chapter 39	Hazardous Waste Fees
Chapter 40	Enforcement and Compliance Monitoring for Hazardous Wastes

Those regulations are administered by the Kentucky Environmental and Public Protection Cabinet, Department for Environmental Protection, Division of Waste Management. There are no TSD facilities in Kentucky that accept universal hazardous waste.

Hazardous Waste Clean-Up

While RCRA addresses management of hazardous waste, it does not address clean-up of spills or other releases. More importantly, it does not address the perpetual liability a generator has for the waste once it is transferred to a TSD facility and presumably properly disposed of at a land fill. While those facilities must meet certain liability/insurance requirements that impact them both during operation and after facility closure, the generator maintains liability for its wastes that are

disposed by the TSD facility. Responsibility for clean ups rests with the USEPA under the 1980 Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) called the Superfund and, subsequently, the 1986 Superfund Amendments and Re-Authorization Act (SARA) under 40 CFR Subchapter J. Those laws extend the liability and the responsibility for clean up of disposal facilities that are causing problems to the generators of the hazardous wastes who disposed them at problem sites. Those two laws close the loop created by RCRA and impose generator responsibility “from cradle to grave” and beyond (in perpetuity or as long as records exist that can attribute wastes from a particular generator to a specific TSD facility).

On-Site Treatment

On-site or in-situ treatment is an option for consideration by KYTC officials in dealing with lead paint residue. Successful treating lead paint residue will avoid the need to adhere to many costly aspects of managing a hazardous waste (permitting, manifesting, hazardous waste transporting, disposal at a TSC facility, recordkeeping and reporting, and hazardous waste generation fees). Treatment/stabilization also addresses the KYTC goal of eliminating/reducing the generation of hazardous wastes. It should be noted that the material remains a hazardous material though, after successful treatment, it would be classified as a solid waste. All OSHA (worker safety and health) regulations would need to be addressed as well as some RCRA-based regulations (discussed below).

Hazardous waste treatment can be defined as any method, technique or process designed to render it non-hazardous. In the case of lead paint residue a successful treatment will eliminate its hazardous waste characteristic (i.e. EP-toxicity). A treatment will not eliminate the lead, but will stabilize it in the paint residue so it will not leach out after being disposed by land filling. Under certain types of treatment, the residue will be rendered non-hazardous if the resulting waste test values are less than 5 mg/L (upper confidence limit using statistically valid sampling/testing/analyses) using TCLP testing for lead when the Hazardous Waste Determination is made. Other types of treatment will fall under the Uniform Treatment Standard that applies to TSD facilities and the necessary treatment level will need to be 0.75 mg/L (upper confidence limit). In either case, a Sampling/Testing Plan must be prepared and provided to the Division of Waste Management for approval.

There are three basic types of treatment for the lead paint residue – pretreatment, treatment during generation, and post treatment. Some sources of information recognize only pretreatment and post treatment considering treatment during generation method to be a pretreatment.

Pretreatment usually consists of applying a special paint over the existing paint to be removed by abrasive blasting. That paint contains additives that render the resulting residue non-hazardous by the TCLP test (e.g. demolition paints). Another method, sometimes considered a pretreatment, involves adding proprietary chemicals to the abrasive, recyclable or more commonly expendable, prior to the blasting process. The chemicals will be mixed with the residue as it is being generated and the resulting mixture will test non-hazardous. A variant of this approach is to broadcast the chemical on the paint residue lying on the floor of the containment enclosure, prior to collection by vacuuming. Under normal conditions, waste residues generated using those methods will be considered non-hazardous prior to storage and only need to be treated below the 5 mg/L threshold. Post treatment can be performed either on- or off-site. Post treatment implies the waste has been generated and placed in a storage/holding container. Chemical additives are placed in the container and mixed to provide the stabilizing treatment. Since the waste has already been

generated and initially stored at its first location of collection it now must be treated to the Universal Treatment Standard of 0.75 mg/L. USEPA Part B RCRA regulations pertain to companies in the business of treating off-site collected hazardous waste. They were not intended to regulate generators who treat such wastes on/off-site. Therefore, the burdensome permitting requirements and costs imposed on a TSD facility do not pertain to a generator, even if it treats wastes after first collection. Waste generators must successfully complete the treatment within 90 days of first collection (8). If they are unsuccessful in treating the waste, they can opt to dispose of the waste as a hazardous waste within the 90-day timeframe and must obtain the necessary permits to do so.

A number of treatments have been used on lead paint residue and have been shown to be effective in rendering it non-hazardous. Some treatments have been used in conjunction with recycling efforts while others have been limited to producing non-hazardous solid wastes that are disposed by land filling. One treatment method has involved adding iron or steel filings or grit either to a expendable abrasive or to the paint residue that was generated using a expendable grit. The second approach would be considered a post-generation treatment. However the EPA has ruled against additions of iron and steel filings and grit as stabilizers for either pre- or post treatment. Those materials will corrode over time and the resulting ferrous corrosion products will not stabilize lead (9). Dilution is not considered an acceptable treatment for a hazardous waste. Requirements for in-tank labeling and storage, waste sampling and TCLP testing/analysis are required for all stabilization methods. In addition to those requirements, the generator must have a Stabilization Plan which includes the Hazardous Waste Determination/Plan. If commercial stabilization products are used those plans are usually provided by the stabilizer supplier. A generic plan can be used for treatment on most projects if no major alterations are made by a contractor.

Other chemical options, some proprietary in formulation, or in application, have proved successful in multiple extraction tests (e.g. the Multiple Extraction Procedure Test – EPA Method 1320). Among the chemicals found to be successful in stabilizing lead for EP Toxicity are asphalts, carbonates and bi-carbonates, cements, epoxies, gypsum, lime, polyolefins, pozzolans, phosphates, pozzolans, silicates, sulfates, urea formaldehyde and combinations of inorganic and organic binders (10-13). Those work in several ways: 1) pH control, 2) reducing solubility in leaching solutions by forming heavy metal molecules, and 3) solidification by encapsulation or fixation. Stabilization treatments have been shown to reduce lead paint residue with baseline (no treatment) TCLP values from 25 to 136 mg/L to less than 0.05 mg/L (14).

Transporting Solid Waste

Requirements for solid waste transporters are covered in KRS 174.450. The applicable Kentucky regulations are 601 KAR 40:010 *Identification of motor vehicles transporting municipal solid waste* and 601 KAR 40.020 *Application for license to operate vehicles transporting municipal solid waste*. Licensed carriers must be used to transport the treated non-hazardous residue to a land fill.

Recycling/Use/Reuse

Under 40 CFR 261.1(c)(7), a material is recycled if it used, reused or reclaimed. A material is “used or reused” if it is employed to make another product. A material is also “used or reused” if it is employed as an effective substitute for a commercial product. A material is “reclaimed” if it is processed to recover a usable product or if it is regenerated. An example of the former is the recovery of lead from spent batteries. Under RCRA the most desirable method of dealing with

waste is to reduce it at the source. In maintenance painting, this can be achieved by employing overcoating, or where total removal is used, employing recyclable abrasives. The next most preferred method is to employ recycling. Regulations governing recycling of hazardous wastes are found in 40 CFR 261.6, 40 CFR 262.2, and 40 CFR 266. Due to USEPA concerns over misuse of recycling, especially where hazardous materials/wastes are involved, rigorous definitions and regulations have been promulgated.

As previous noted, RCRA defines a hazardous waste as a solid waste that is abandoned (disposed of), recycled, or is considered inherently waste-like. A hazardous waste must exhibit characteristics of hazardous waste, be listed as a hazardous waste, or be a mixture that contains a nonhazardous solid waste (e.g. an abrasive) and a listed or characteristic hazardous waste (lead paint residue). RCRA prohibits the long-term accumulation of solid waste purported for recycling purposes (e.g. “stored material that will be recycled when the scrap market price reaches a sufficiently high level”) terming it “Speculative Accumulation”. Speculative accumulation is defined as the accumulation of waste materials prior to recycling without sufficient amounts being recycled. A sufficient amount (necessary for compliance) is defined as using at least 75 percent of the total quantity generated during a calendar year (40 CFR 261.(c)(8)).

Some recycled materials are classified as solid wastes while others are exempt from regulation as wastes (40 CFR 261.2(c) through 40 CFR 261.2(e)). Certain materials that are recycled in particular ways (i.e., used in a manner constituting disposal (using spent oil for dust suppression), burned for energy recovery, reclaimed, or speculatively accumulated) are designated solid wastes (40 CFR 261.2(c)). Some materials are considered inherently waste-like no matter how they are recycled (40 CFR 261.2(d)). Others that are recycled through use or reuse may qualify for exemptions from the solid waste definition (40 CFR 261.2(e)). Section 261.6 describes regulations that apply to hazardous wastes that are recycled.

A material may be used or reused if it is employed as an ingredient in an industrial process to manufacture a product, or is employed as an effective substitute for a commercial product (40 CFR 261.1(c)(5)(i & ii)). Recyclable materials are not solid wastes when they are used or reused, or returned into the original primary production process in which they were generated (40 CFR 261.2(e)(1)). However, those materials cannot be reclaimed (i.e. extracted from a bulk waste) prior to those applications. Those exclusions do not apply to use in a manner constituting disposal, burned for energy recovery, or speculatively accumulated.

All recycling activities must constitute legitimate reclamation or reuse. To encourage those activities, the EPA subjects those activities to reduced regulation. Some recycling activities may be claimed to be legitimate when, in fact, they are ruses to avoid hazardous waste regulation. Guidelines have been established for legitimate recycling and the EPA has described activities it considers to be “sham recycling” (45 FR 333093, May 19, 1980 and 48 FR 11157, March 16, 1983). For legitimate recycling, the material must be effective for the claimed use, it must not be used in excess of the amount necessary and the recycling facility must maintain records of the recycling transaction.

In general acceptable recycling falls outside of most RCRA requirements as no waste is being generated. However, regulations impacting on-site storage should be complied with as a precaution against potential problems such as spills wherein the resulting material may not be acceptable for recycling and hazardous disposal must be employed. The use of RCRA-acceptable

containers (e.g. 30- & 55-gallon steel drums) is also a good precaution and would not add significantly to disposal costs.

In the past, state highway agencies (SHAs) and others have attempted to recycle lead paint residue. Those methods have included pretreatments to render the residue nonhazardous and mixing with asphalt, cement and clays. Those materials were to be employed in beneficial reuse applications. In the latter cases, the residue was substituted for fine aggregates and the resulting materials were used for pavements, barrier walls and bank stabilization. In the former case, the material was experimentally incorporated in bricks. Other options investigated include cement kiln feeds, use as airport antiskid material, lead smelter feeds and glass fiber/felt production (15). Another effort investigated several options including the separation of lead paint residue incorporating expendable abrasives into a nonhazardous waste, reusable abrasive and a hazardous material that would be recycled in a lead smelter (16). Other possibilities investigated included the use of the residue in glass manufacturing. A few state highway agencies may be incorporating lead paint residue in concrete for reuse in highway applications. However, this approach requires special handling of the residue as it is a hazardous material and special precautions are needed to reuse it in this type of application. Therefore, it is not considered a viable option for consideration by KYTC.

Hazardous Waste vs. Hazardous Material

A material that is recycled is not wasted. Some forms of recycling may have waste streams associated with them and a hazardous material can produce some hazardous wastes as a consequence of recycling. This factor comes into play when addressing issues such as sham recycling. Recycling must be a valid activity serving some significant purpose and not be a means of avoiding RCRA requirements.

If lead paint residue is recycled it falls outside of regulation under RCRA Subtitle C (17, 18). However, due to its hazardous characteristic (e.g. lead is toxic) it remains a hazardous material and must be treated as such. In generating lead paint residue, KYTC must address numerous OSHA (e.g. 29 CFR 1910.1025 and 29 CFR 1926.62) and USEPA regulations that effect operations up to temporary storage of hazardous wastes (as addressed in KAR Chapters 31 to 40). At any point in the recycling process short of the actual recycling process, lead paint residue can revert to a hazardous waste. There can be an on-site release, a spill in transit to the recycling facility, or the recycling facility can reject the material if it has been co-mingled with other wastes such as aluminum soda cans, old clothes or used tarp material. To deal with those occurrences KYTC officials must provide contingencies for disposing of the released/spilled/rejected material as a hazardous waste. In those cases the material would fall under RCRA and its appropriate regulations (or equivalent Kentucky environmental regulations).

Transporting Hazardous Material

A major difference between hazardous wastes and materials are the requirements for transport from the job site to the ultimate destination, either TSD facilities for hazardous wastes or recycling/manufacturing facilities for hazardous materials. Hazardous waste transport falls under RCRA (40 CFR 263) with attendant requirements (40 CFR 262). Hazardous materials transport is regulated by the U.S. Department of Transportation under the Hazardous Materials Transportation Act (49 CFR – specifically, Subtitle B Parts 100 to 180; in particular Parts 171 to 173, 177, 178, and 180 as amended and codified in 49 U.S.C. 5101) covering both interstate and intrastate shipments of those materials. In Kentucky, those are governed by KRS 174.400 to 174.425 and by regulations in 601 KAR 1:025. The relevant terms are “shipper”, “offerer”, and “commerce”. The

terms “shipper” and “offerer” are considered synonymous. The applicable laws/regulations impact materials that are transported for commerce rather than those that are transported for disposal (19). The use of certified hazardous waste transporters is not required. Neither is manifesting. However, there are requirements for licensed hazardous material transporters (these can be contract or common carriers) including requirements for shipping papers. Hazardous material carriers must be licensed in each state through which the material is transported.

Specific laws/regulations impact transport of lead paint residue (that is a hazardous material at nearly all lead concentrations). Certain requirements for shipping hazardous materials that are the responsibility of the shipper (49 CFR 173 and 49 CFR 172.101):

- Determine whether a material meets the definition of hazardous material
- Provide the proper shipping name (environmentally hazardous substances, solid, n.o.s.- not otherwise stated)
- Identify the material class/division (Class 9 for Miscellaneous Dangerous Goods*)
- Identify the material number (UN3077)
- Provide a hazard warning label (49 CFR Subpart E Part 172 - Class 9*)
- Employ proper containers (49 CFR 173.213)
- Marking. (49 CFR 172.301 for non-bulk containers; 49 CFR 172.302 for bulk containers)
- Employee training
- Shipping papers
- Emergency response information
- Emergency response telephone number (See below)
- Certification
- Compatibility
- Blocking and bracing
- Placarding (49 CFR Subpart F Part 172 – not required for domestic transport)
- Security plan
- Incident reporting

Specific laws/requirements for hazardous materials shippers are duplicated to some extent by the RCRA/OSHA requirements related to employee training, generating, storing and transporting hazardous materials and by requirements set forth in KYTC project special notes.

Hazardous materials carrier responsibilities are provided in 49 CFR 100 to 180 including requirements for the transport vehicle. The carrier must ensure that the hazardous material offered by the shipper is properly described and packaged. Interstate motor carriers of placarded loads must comply with hazardous materials requirements contained in 49 CFR 397. Specific motor carrier responsibilities include:

- Shipping paper (49 CFR 172 Subpart C)
- Placarding and vehicle marking
- Loading and unloading
- Compatibility
- Blocking and bracing
- Incident reporting (49 CFR 171.16)
- Security plan
- Employee training (49 CFR 177.816; 49 CFR 390 to 397).

(* Assumes the lead paint residue shipment contains over 10 lbs. of *lead* less than 100 microns in diameter.)

The most important of these requirements may be incident reporting in case of an accident during transport (including loading, unloading and temporary storage). Shipping papers are intended to communicate a hazard. The shipper must describe the hazardous material in the shipping paper (49 CFR 172.202). The basic hazardous material description includes the proper shipping name, hazard class, identification number, and packaging group. The class names, IMO class and division numbers or subsidiary hazard classes may be entered in parenthesis. Entries are required for the number and type of packaging and weight (net or gross). Regulation requires an emergency response telephone number to be placed on the shipping paper. The telephone number must be monitored at all times while the load is in transit to its final destination (including temporary storage). The shipping paper should contain a certification of accuracy for the shipping paper – the painting contractor should be the person certifying the shipment as he best knows what is being shipped, how much it weighs and the type of containers employed. No material can be transported without a shipping paper. Shipping papers can also be Bills of Lading. Hazardous materials shipping papers must be retained for 1 year by the motor carrier/KYTC. Painting contractors should be required to provide copies of shipping papers to KYTC when projects are completed.

Standard U.S. DOT containers specified for hazardous waste transport will suffice for non-bulk transport that is in Packing Group III for “Minor” danger (49 CFR 172.101). It is the shipper’s responsibility to provide the appropriate containers (with proper markings). The shipper must also ascertain that the containers are properly closed, secured, and cushioned to prevent damage, for example, 55 gallon drums strapped onto pallets that won’t tip over during normal transport. Package marking requirements are per 49 CFR 172.301 for non-bulk packaging and 49 CFR 172.302 for bulk packaging). For lead paint residue, there are no compatibility concerns.

The security plan and security training are thought to generally fall on transporters.

Task 3. Identify commercially available additives for stabilizing paint debris and investigate recycling options

Stabilization and recycling were both valid options for reducing the amount of hazardous waste produced by generating lead paint residue. This task was performed to identify desirable methods for stabilization and options for recycling. It was intended as a precursor to two experimental KYTC bridge maintenance painting projects to demonstrate/evaluate the use of those methods. Several decisions were made by the KYTC Study Advisory Committee that impacted that work. The Study Advisory Committee included representatives from the EPPC Division of Waste Management to apprise them of study findings and obtain permission and guidance to employ in-situ stabilization and recycling on the KYTC projects. While Kentucky had adopted federal laws and USEPA and US DOT regulations addressing hazardous wastes/materials, KYTC officials were concerned that Division of Waste Management might have interpretations that would impact or prohibit the use of stabilization and/or recycling.

Several decisions were made regarding stabilization and stabilization/recycling. KYTC officials were not interested in performing stabilization using generic stabilization procedures such as mixing lead paint residue with cement or pozzolans. Secondly, KYTC officials did not want to stabilize the residue by using it as a substitute for fines in Portland cement or asphalt and subsequently by employing those materials for highway applications. In part, that was due to

concerns about processing the residue to properly stabilize it (e.g. reduce the EP Toxicity to a suitably low level). There were other concerns related to the potential of accidental releases of the residue. Another SHA had experienced that problem during in-house recycling. This meant that proprietary stabilizing materials/methods/sources were to be investigated. Recycling was to be limited to reclamation of the lead or other method of use/reuse at a commercial recycling/production facility.

Proprietary Stabilization Chemicals/Methods of Treatment

Investigation of commercial/proprietary stabilization chemicals sought to identify those that had been routinely used to treat lead paint residues, especially those generated during maintenance painting operations. KTC researchers had used a proprietary material, LEADX[®], from RC Global Marketing, Inc. to filter micron-sized lead paint particles from wastewater produced during overcoating operations. The same material had been blended in expendable abrasive as a pretreatment to stabilize lead paint residue during total removal by abrasive blasting. LEADX[®] is a phosphate that can be obtained in granular or powder forms. BLASTOX[®], from the TDJ Group Inc., is another chemical stabilizer that has had widespread use to treat lead paint residue. It has typically been blended with expendable abrasives. BLASTOX[®] incorporates chemistries identified “Best Demonstrated Available Technologies” by the USEPA (silicates). Both LEADX[®] and BLASTOX[®] provide treatment during waste generation. A third stabilizer, PreTox 2000FD (Fast Dry), from NexTec Inc., also had been used for stabilization including residue from bridge maintenance painting. It is a single-component temporary overcoating applied over existing lead paint prior to abrasive blasting. Upon abrasive blasting using either expendable or recyclable abrasives or power tools, PreTox renders the resulting paint residue nonhazardous. PreTox is a true pretreatment. Similar coatings, termed “demolition coatings” have been applied to leaded structures prior to their demolition to render the resulting wastes non-hazardous. A fourth source of lead paint stabilizers is Forrester Environmental Services Inc. that provides several pre-, during- and post-treatment products under the FESI-BOND[™] trade name. Those proprietary stabilization materials are summarized/evaluated in Table 1.

Part of the investigation of the suppliers of stabilization chemicals included reference checks that involved the identification of painting contractors who had used those materials on lead paint residue. Where significant literature existed on past applications of those materials, reference checking was not performed. All of the reference contacts were positive on the use of specific stabilizing chemicals. Another concern was the ability of those chemicals to provide long-term stabilization for paint residues. The best test to confirm that capability is the previously discussed Multiple Extraction Procedure (MEP) test. All of the stabilization chemical suppliers had subjected their materials to those tests previously and all had shown the ability to maintain long-term resistance to leaching. Materials Safety Data Sheets were obtained from the manufacturers and reviewed to determine if their use constituted any special concerns related to worker safety. None were identified.

A second part of this investigation involved identification of contained (RCRA Subtitle D) landfills that would accept stabilized lead paint residue. In Kentucky some of those landfills have regional restrictions for accepting wastes limiting options for that type of disposal. A list of 26 landfills was provided by the EEPD Division of Waste Management. Those landfills were surveyed to determine:

- If they would accept stabilized lead paint residue.
- The counties from which they could accept wastes.

- Testing/documentation requirements for solid wastes containing lead.
- Additional services they could provide (furnishing storage/transport containers/liners and transporting wastes)
- Their charges for supplying containers/liners and tipping fees (including how those were assessed).
- If the landfill was still active.

Information gathered indicated that 23 of the landfills were still in service. All of them would take the stabilized lead paint residue, but TCLP tests were required. For most of the landfills, those test requirements were typically less (one sample) than the minimum required under RCRA. Some landfills stated that one test was acceptable as long as it was representative of the waste provided. Two landfills required a TCLP test for each bulk waste container (roll off). Two others required three composite samples for the first 100 yd³ of waste and one sample every additional 500 yd³. Some landfills require a day or two to review the TCLP results before accepting the waste. Several firms will deliver roll offs with liners and pick them up to dispose of the waste. Container costs were about \$200 for a roll off and a hauling fee of \$7 per mile. Disposal costs varied by method of measurement and land fill. Per ton disposal costs ranged from \$20 to \$42. Per cubic yard (yd³) cost ranged from \$8 to \$23. A per barrel cost was quoted by one landfill (\$67). The landfill survey is provided in Appendix 1.

Recycling

Initial recycling efforts focused on identifying facilities that would accept lead paint residue for recycling. Two potential types of facilities were investigated, rotary kilns and lead smelters. Material/waste brokers and cement plants were contacted in an effort to locate rotary kilns where the residue could be burned and the ashes incorporated into cement. However those parties stated that while they had used feed stocks containing heavy metals in the past, they were now unwilling to do so now. Questions also arose about the heating value of the residue and RCRA provisions for use of incineration for recycling. As a consequence, that recycling option was abandoned. Lead smelters appeared to be a viable recycling option. Contact with transportation officials at an SSPC Structure Painting Council national meeting revealed that there were several lead smelters that had recycled lead paint residue in the past. When contacted they stated that problems had been encountered in their operations as a result of using lead paint residue and that they were now unwilling to accept it for recycling. Several lead recyclers and battery factories were contacted and they were also unwilling to recycle the residue. One source indicated that the Doe Run Company had a recycling plant that might be willing to accept the residue.

The Doe Run Company, based in St. Louis, Missouri, is an international natural resource company focused on metals mining, smelting, recycling and fabrication. Doe Run is North America's largest integrated lead producer and the third largest total lead producer in the world. Additionally, the company retrieves and recycles more than 150,000 tons of lead annually from manufactured products such as batteries and telephone cables. The firm has a recycling facility in Boss, MO. That plant was contacted and the manager stated the company had routinely accepted lead paint residue for recycling/reuse purposes. Several SHAs including those of Hawaii, Florida, Oregon, Missouri, and Washington had recycled their lead paint residue at the Boss plant. He said that the residue had to be produced by either sand-blasting (not acceptable to KYTC due to potential silicosis exposure hazards) or recyclable steel grit blasting. The manager noted that most smelters were not set up to effectively deal with a variety of lead-based materials. The Boss plant was a secondary smelting plant that accepted old batteries, cathode ray tubes, and other miscellaneous lead-containing scrap for refining. U.S. As most lead paint residues had a very low

concentrations of elemental lead, usually less than one percent, recycling to extract the lead constituted sham recycling. However, the residue could be accepted if it contained silica sand, iron or steel grit. Those materials were necessary constituents in the smelting process used to form a protective slag over the molten lead during smelting/refining process. Lead paint residue containing those materials could be accepted as a commercial substitute under RCRA (40 CFR 261.2(e)). The plant could accept the residue in 55-gallon steel drums, 55-gallon or cubic-yard poly bags, or cubic-yard corrugated cardboard Gaylord-type boxes. The containers needed to be placed on pallets with the appropriate labeling facing outward when loaded into the transport vehicle. Doe Run has several preliminary forms that must be completed prior to accepting the residue. A standard Bill of Lading would suffice for delivery paperwork and the plant would also accept manifested residue. Doe Run would issue a settlement report and a certificate of recycling once the residue had been processed. The manager also provided approximate costs for recycling (in the range of 1 to 200 drums for \$125 to \$135 per drum).

Cost Comparisons between Options

After options for stabilization and recycling had been obtained those were presented to the KYTC Study Advisory Committee. EPPC Division of Waste Management committee members assisted in obtaining agency reviews of the proposed treatments/recycling to the appropriate decision-makers within their agency in late 2004 (20, 21). With those approvals work began on planning experimental maintenance painting projects to determine whether the selected technologies were effective and to ascertain their effects on costs and maintenance painting operations. Prior to that effort KYTC officials wanted cost estimates to be prepared to compare costs associated with conventional hazardous waste disposal, treatment, and recycling.

To develop costs for each option process flowcharts were developed to ensure that all pertinent factors were considered in the costing process and identify potential issues/resolutions. The experimental projects were to employ total removal by abrasive blast cleaning to maximize the amount of lead paint residue generated. The flowchart in Figure 1 portrays the conventional hazardous waste disposal process currently employed by KYTC. The flowchart in Figure 2. presents the proposed stabilization process for the experimental tests that were to evaluate the four previously identified proprietary stabilization products. Portions of the lead paint residue from bridges to have the stabilization tests were to be left untreated and disposed as a hazardous waste to serve as reference standards accounting for the hazardous waste process branch. The flowchart in Figure 3 presents the proposed recycling process. Additionally, provisions needed to be made in case the recycling facility would not accept the lead paint residue due to contamination.

Cost estimates were prepared for the various means of disposal/recycling (Appendix 2). In preparing those estimates, the cost of contractor labor for on-site material handling was considered to be identical for the various means of disposal/recycling and was not included in the estimates. This was done to compensate for differences in operational practices/labor efficiency/costs between the various contractors.

The first cost estimate was for hazardous waste disposal using recyclable grit for waste generation. This is the most common method used by contractors in generating/disposing of lead paint residue from KYTC projects. A baseline area to be painted of 50,000 ft² was provided by KYTC officials as being representative of typical overpass bridges. Estimates of the weight of lead paint to be removed ranged from 2 to 5 tons with 5 tons being used (including the weight of mill scale that would be removed). Several contractors were contacted to provide estimates of the

amount/cost of recyclable steel grit that would be used on a project of this size. They were also asked how much grit would be lost due to leakage from containment and wastage due to use. The range of grit costs was \$600-\$800 per ton. The loss rate from all causes was given as 3-4 tons. For the purpose of estimation, the higher costs/quantities were used. Since the recycled abrasive was reclaimed for future use on other projects, it was not included in the cost estimate. The contractors also estimated the quantity of waste generated (in terms of 55-gallon drums). Those estimates ranged from 15-25 drums. A recent KYTC project provided additional data that indicated a similar project would produce 40 drums. For this cost estimate 30 drums was used for the total amount of waste generated. This would be equivalent to a total waste of 18,000 lbs (10,000 lbs for the lead paint residue and 8,000 lbs for the waste grit assuming 100 percent efficiency for grit recovery). Hazardous waste disposal costs were quoted by a TSD firm that routinely handled KYTC lead paint residue. That firm hauls the waste to Michigan for treatment and subsequent disposal in a Subtitle D landfill. The disposal cost for the 30 drums of hazardous waste was estimated to be \$5,481. That cost included \$1,275 for freight (by licensed hazardous waste transporter), \$2766 for disposal (30 drums @ \$92.20 per drum) and \$1,800 for containers (30 drums @ \$60 per drum). The contractor's cost in generating/disposing the waste (excluding labor and oversight costs) was \$29,741 or \$3,718 per ton. That included costs for disposal (\$5,481), lost abrasive (\$2,400) and major equipment costs (\$21,500). The latter cost was provided as a one-month rental fee for the recycling machine/trailer provided by a major manufacturer of that equipment. KYTC costs were defined as the contractor's generation/disposal cost (\$29,741) plus the EPPC permitting/assessment costs (\$336) for a total cost of \$30,077. KYTC personnel costs related to permitting, recordkeeping and reporting were not included. TCLP testing costs were also not included in the estimate.

The second cost estimate was for hazardous waste disposal using expendable abrasives for waste generation. The same 50,000 ft² area to be painted was used along with the 5 tons for lead paint residue. The amount of expendable abrasive was estimated at 125 tons. A local abrasive supplier quoted a cost of \$85 per ton for coarse abrasive supplied in bulk containers for a total abrasive cost of \$10,625. The TSD firm quoted a price for providing roll offs (bulk storage boxes) including liners of \$350 each for 17-ton capacity units. The total waste was 130 tons requiring 8 roll offs. The total disposal cost included freight (\$1,275 per roll off), treatment and disposal (\$75 per ton), and roll off rental (\$350 per roll off). For the 8 roll offs needed the total disposal cost of the lead paint residue was \$22,750. The contractor's cost in generating/disposing the waste (excluding labor and oversight costs) was \$39,375 or \$303 per ton. The cost for included the abrasive (\$10,625), disposal (\$22,750) and major equipment (\$6,000 for 3 blast pots). The latter cost was provided as a one-month rental fee for the blast pots provided by a major manufacturer of the equipment. KYTC costs were defined as the contractor's generation/disposal cost (\$39,375) plus the EPPC permitting/assessment costs (\$820) for a total cost of \$40,195. KYTC personnel costs related to permitting, recordkeeping and reporting were not included. Costs for TCLP testing were not included.

The third cost estimate was for hazardous waste disposal using expendable abrasives blended with a stabilization chemical for waste generation. The same 50,000 ft² area to be painted was used along with the 5 tons for lead paint residue. The amount of expendable abrasive with blended stabilizer was estimated at 144 tons. A local abrasive supplier quoted a cost of \$165 per ton for coarse abrasive pre-blended with the chemical stabilizer supplied in bulk containers for a total cost of \$23,760. The TSD firm quoted price for providing roll offs (bulk storage boxes) including liners of \$350 each for 17-ton capacity units was used for this cost estimate. The total waste was 149 tons requiring 9 roll offs. The total disposal cost included freight (\$150 per roll off), disposal

(\$25 per ton), and roll off rental (\$350 per roll off). For the 9 roll offs needed the total disposal cost of the lead paint residue was \$8,225. The contractor's cost in generating/disposing the waste (excluding labor and oversight costs) was \$31,985. The cost for included the abrasive and stabilizer (\$23,760), disposal (\$8,225) and major equipment (\$6,000 for 3 blast pots). The latter cost was provided as a one-month rental fee for the blast pots provided by a major manufacturer of the equipment. The contractor's cost for generation/disposal of the lead paint residue was \$37,985 or about \$255 per ton. KYTC costs were defined as the contractor's generation/disposal cost (\$37,985). There would be no EPPC permitting costs (for conditionally exempt small quantity hazardous waste generation) related to miscellaneous items such as filters, clothing, tarps. KYTC personnel costs related to permitting, recordkeeping and reporting were not included. Costs for TCLP testing were also not included.

The fourth cost estimate was for hazardous material recycling using recyclable abrasives for lead paint residue generation. The same 50,000 ft² area to be painted was used along with the 5 tons for lead paint residue. As with the first cost estimate, the recyclable steel grit wastage and costs were 4 tons at \$800 per ton. Since the recycled abrasive was reclaimed for future use on other projects, it was not included in the cost estimate. For this cost estimates 30 drums was used for the total amount of waste generated. This would be equivalent to a total waste of 18,000 lbs (10,000 lbs for the lead paint residue and 8,000 lbs for the waste grit assuming 100 percent efficiency for grit recovery). Hazardous material recycling costs were quoted by the Doe Run Smelter at Boss, MO. The recycling cost for the 30 drums of hazardous waste was estimated to be \$6,500 including \$650 for freight (by a common carrier), \$4,050 recycling cost (30 drums @ \$135 per drum) and \$1,800 container cost (30 drums @ \$60 per drum). The contractor's cost in generating/recycling the lead paint residue (excluding labor and oversight costs) was \$30,400 or \$3,800 per ton. That included costs for recycling (\$6,500), lost abrasive (\$2,400) and major equipment costs (\$21,500). The latter cost was provided as a one-month rental fee for the recycling machine/trailer provided by a major manufacturer of that equipment. KYTC costs were defined as the contractor's generation/recycling cost (\$30,400). There would be no EPPC permitting costs (for conditionally exempt small quantity hazardous waste generation) related to miscellaneous items such as filters, clothing, tarps. KYTC personnel costs related to permitting, recordkeeping and reporting were not included. Costs for TCLP testing were also not included in the cost estimate.

The cost estimates included several major assumptions/exclusions. However, they show that none of the currently used or planned disposal/recycling methods posed significant additional costs compared to the others. KYTC in-house costs were not included as well as some complexities posed by the planned experimental projects. Having reviewed the proposed processes and costs the Study Advisory Committee decided to proceed with several experimental maintenance painting projects to determine the effectiveness of stabilization and recycling (and to identify any necessary revisions in follow-on deployments of those methods).

Task 4. Work with KYTC official to develop experimental bridge maintenance painting projects incorporating recycling and hazardous waste stabilization

KYTC officials planned two potential experimental maintenance painting projects to monitor operations and evaluate the four stabilizing chemicals previously identified under this study and the recycling option at Doe Run. The first project incorporated four bridges in the

Bowling Green area. Those bridges were all deck girder structures with areas to be cleaned and painted in the range of 30,000-40,000 ft². Those bridges were:

1. *Allen County FE02 0002 031E B00007 019.11 (Scottsville - Glasgow Road) US 31E over Barren River Lake* **Description:** 76 ft - 133 ft - 165 ft - 133 ft steel beam spans
Estimated structural steel surface area – 41,200 ft²

2. *Warren County FE02 0114 3225 B00007 000.05 (First and State Street) KY 3225 over Barren River* **Description:** 110 ft - 110 ft - 110 ft - 110 ft steel beam spans
Estimated structural steel surface area – 42,800 ft²

3. *Butler County FE02 0016 0185 B00023 000.00 (Bowling Green - Caneyville Road) KY 185 over Green River* **Description:** 120 ft - 170 ft - 120 ft steel beam spans
Estimated structural steel surface area – 33,000 ft²

4. *Warren County FE02 0114 0101 B00009 000.00 (Smiths Grove – Scottsville Road) KY 101 over Barren River* **Description:** 72 ft - 120 ft - 160 ft - 120 ft steel beam spans
Estimated structural steel surface area – 35,000 ft²

KYTC officials and KTC researchers developed the Special Notes for lead paint residue treatment/disposal/recycling for the experimental project (Appendix 3). The experiment design included the use of lead paint residue from the US 31E bridge to test stabilization using LEADX[®]. Lead paint residue from the KY 185 bridge was to be stabilized with BLASTOX[®]. Both stabilizers were to be blended with expendable abrasives. The two Warren County bridges, KY 3225 and KY 101 were to have their lead paint residue sent to the Doe Run smelter in Boss, MO for recycling.

A second project was planned to evaluate the other two stabilizing chemicals. However it was never conducted due to KYTC funding limitations for bridge maintenance painting.

Special Provisions for the Experimental Projects

For total removal of the existing lead paint, all of the bridge steel was to be totally enclosed using containment that met the criteria for **SSPC Guide 6 – Containment Classification Class 2A with an entryway condition E2 (Re-sealable)**. For worker safety, air flow had to be provided during blast cleaning operations and the lead paint residue had to be collected (typically by vacuuming) at the end of each work day.

The two structures using the residue stabilizers were assigned 2,000 ft² areas of bridge steel that were to be initially abrasively blast cleaned. The purpose was to have reference areas to determine whether the Hazardous Waste Determination (TCLP sampling and testing) would classify untreated lead paint residue as hazardous. That residue was to be stored separately from the treated lead paint residue. Also, the reference areas could be examined in the future if any premature coating deterioration occurred on the bridges that might be related to use of the pre-blended abrasives. The balance of the bridge steel was to be blast cleaned using the blended abrasive/stabilizer mixes with the mix ratios for both materials pre-established at a ratio of 15 percent stabilizer to 100 percent abrasive (by weight). Both stabilizer suppliers were to provide pre-blended abrasives. A waste testing firm in Louisville was contracted by KYTC to perform sampling of the residue generated and conduct the TCLP tests. The KYTC Division of Environmental

Analysis was to obtain EPA hazardous waste permits based upon the hazardous waste determinations. The painting contractor was to dispose of the lead paint residue based upon the test results. On-site handling and storage requirements were identical to those imposed for conventional projects employing hazardous waste disposal.

The two structures having the lead paint residue recycled were to employ recyclable steel grit. The waste grit was to be used as a commercial substitute for ferrous materials in slag by the recycling firm, Doe Run. The material was to be transported by a registered hazardous material hauler in case the material was rejected by Doe Run for being co-mingled with wastes (which was prohibited by the Special Note). For that contingency, the material was to be held at Doe Run until an EPA permit could be obtained and then transported to a TSD facility for disposal.

Preliminary Work

KTC researchers obtained samples of the existing lead paint from the four bridges. Those were taken to the Center for Applied Energy Research (CAER) at the University of Kentucky and their lead contents were measured using inductively coupled plasma-atomic emission spectrometry. The lead contents for the US 31E bridge and the KY 185 bridge measured 0.38% and 0.59% respectively (by weight). The lead contents for the KY 3225 bridge and KY 101 bridge measured 0.57% and 0.38% (by weight) respectively.

A pre-bid meeting was held on December 3, 2004 at the KYTC District 3 office in Bowling Green to familiarize bidders and KYTC district personnel with the experimental project requirements. Eight painting firms were represented at the meeting. After reviewing the Special Notes and answering questions at the office, KYTC officials conducted site visits at the four bridges to familiarize the contractors with the locations of the structures and their environs. KYTC officials stated that the contractor could seek temporary waste storage areas on private property, but would have to move it to locations along the rights of way near the bridges if the wastes tested hazardous.

The project was let on January 21, 2005 and awarded to Vimas Painting Co. of Campbell, OH for \$894,422 (\$5.88/ft²). The Engineer's Estimate was \$1,232,490. Four bids were submitted ranging from \$894,422 to \$1,625,935.

A pre-construction meeting was held on February 2, 2005 at the KYTC District 3 office in Bowling Green. The Special Notes were reviewed and the contractor stated he planned to begin work in late May. At that time, he also stated that he planned to have one crew doing most of the work other than rigging and de-rigging, thereby limiting lead paint residue generation to one bridge at a time.

Experimental Project Work

The contractor began his initial painting operations on the KY 101 bridge on May 18, 2005 (Figure 4). He employed recyclable steel grit using a recycling/vacuum trailer to collect the lead paint residue and separate it from the reusable grit. The trailer was also equipped with several blast pots to provide abrasive/compressed air for blast cleaning (Figure 5). The lead paint residue including the spent abrasive was vacuumed out of the containment enclosures. The lead paint residue removed from the vacuum/recycling trailer was stored in sealed 55-gallon steel drums at temporary storage areas near the worksites (Figure 6). This work proceeded without incident with some 19,608 lbs of lead paint residue generated.

Lead paint residue from the KY 3225 bridge was collected in a similar manner to the KY 101 bridge. Blast cleaning operations generated 29,695 lbs of lead paint residue. The material was placed in temporary storage.

The paint residue from both projects was subsequently sent to the Doe Run smelter for recycling.

In late May 2005, the contractor encountered problems in obtaining LEADX[®] pre-blended with an expendable abrasive. Initially, he elected to purchase his abrasive for that portion of the work and blend it on site. In subsequent discussions with KYTC District 3 and Central Office officials, he requested that both stabilization treatments be revised to incorporate the use of recyclable abrasives. He stated that this would significantly reduce the amount of material that needed to be wasted and that he had the equipment on site to perform that work. He proposed that the stabilizers could be added to the recycled abrasive pot on the vacuum/recycling truck prior to abrasive blasting and applied in the same manner as the pre-blended stabilizer in expendable abrasives. KYTC officials offered to accede to his request if both stabilization chemical manufacturers were willing to approve it. Both TDJ Group (BLASTOX[®]) and RC Global Marketing (LEADX[®]) agreed in writing to the proposed change and KYTC approved the contractor's change order.

The first stabilizer used with recyclable steel grit was BLASTOX[®] on the KY 185 bridge in mid-June 2005. The contractor cut a hole in the top of the recycled grit storage bin on the vacuum/recycling trailer to accept the stabilizer. BLASTOX[®] was packaged in bulk plastic bags weighing about one ton. A bag was suspended over the hole from a boom truck and an opening was cut in its bottom allowing the stabilizer to flow into the recycling trailer storage bin as the grit was being charged during the recycling operation (Figure 7). The stabilizer flow rate was crudely metered by tying a choker around the hole in the bag (Figure 8). A stabilizer flow rate of about 7 lbs per minute was sought that would produce a stabilizer-to-grit ratio of six percent by weight. Every time a new bag was employed, workers would measure the flow rate by collecting the bag output for a short time period and weighing the charge. The flow rate varied from 5.7 to 8.7 lbs per hour. The latter was close to a ratio of 10 percent stabilizer to grit by weight. The flow rate was observed to vary during the process, reducing as the bag emptied. However no adjustment was made for that except if material remained in a bag at the end of a work day. The next morning the flow rate was recalibrated. On this bridge, 13,300 lbs of waste (stabilizer and lead paint residue) was generated.

The same approach was used to add the LEADX[®] stabilizer to the recyclable grit on the US 31E bridge (Figure 9). A flow rate of one lb per minute was to be used. The flow rate was typically higher varying between one to three lbs per minute. Closer attention was paid to the change in flow rate as the bag emptied in an attempt to achieve a more consistent stabilizer-to-grit mixing ratio. One of the LEADX[®] bags broke while suspended charging a large amount of the stabilizer into the bin. The workers attempted to separate it. For that mixture the stabilizer-to-grit ratio was undetermined, but large. Another problem occurred when a long rain set in. The LEADX[®] bags were permeable and, despite attempts by the contractor to keep the material dry, it became moist. This caused it to clump making metering difficult. It also resulted in small lumps of the stabilizer being deposited on the steel surfaces being blast cleaned. On this bridge, 12,600 lbs of waste (stabilizer and lead paint residue) was generated.

Work on this project was completed on August 8, 2005.

Test Results from the Stabilized Lead Paint Residue

The initial plan had been to obtain samples of the hazardous/stabilized wastes on a frequent basis (daily). However, the test laboratory's response time to requests for sampling was too slow to permit timely sampling and testing. Sampling was performed on a more random basis by the contractor's foreman or KYTC inspectors who took grab samples from the recycling trailer storage bins. KTC researchers subsequently delivered those samples to laboratory for testing (Figure 10). That plan was frustrated in part by the rapid pace at which the contractor performed blast cleaning operations. The experimental plan did not have mandatory hold periods for the contractor while the wastes were sampled and analyzed. It was not possible to conduct the tests and make any adjustments to the stabilizer dosages. Also, there were transition periods between application of the standard process area where the amount of stabilizer being applied was thought to be less than the targeted amount.

Another problem was encountered with the vacuum/recycling unit. That unit had five separate waste collection points including two air washes, a cyclone, a screen (filter) and a dust collector. The dust collector was run during abrasive blasting to promote air flow and remove airborne fines generated by blasting. It also served as the final filtration during recycling of the steel grit. Other than the dust collector, the smallest particles were collected at the first air wash (Air 1). The next smallest particles were collected at the second air wash (Air 2). The next smallest were collected in the cyclone and the largest chips were collected at the screen. They were comprised of differing amounts of lead paint and spent abrasives and each had a particular size/weight distribution that differed from the rest. Once the grit/stabilizer mixture was used for blast cleaning there was no means of ensuring that the stabilizer/paint residue ratio would be consistent at each of the waste collection points on the vacuum/recycling unit. With pre-blended expendable abrasives that is not a problem as the vacuum trucks typically used to collect that waste are usually equipped only with a single dust filter. When sampling was conducted on this project it consisted of single extractions from each of the 5 collection points. To be more statistically accurate four samples should have been obtained at each collection point. Additionally no record was kept of the amounts of lead paint residue generated at each collection point for the vacuum/recycling unit, only the total amounts of residue for each structure.

An inspection of the TCLP data from both stabilizers provided in Tables 2 and 3 shows variances with anticipated results. The highest TCLP leachable lead values were obtained at the first air wash collection point for most sampling events (230-750 mg/L). Several samplings at that collection point using BLASTOX[®] provided TCLP values were low (0.1-0.9 mg/L). The LEADX[®] TCLP values at that collection point were over hazardous waste threshold (32-65 mg/L). Generally BLASTOX[®] provided lower TCLP values at all collection points compared to LEADX[®]. That can be explained in part by more irregular dosing of that material due to wetness and the broken bag. The total stabilizer dosages for the KY 185 (BLASTOX[®]) and US 31E (LEADX[®]) bridges are shown in Table 4. While the lead content in the paint residue was higher for KY 185 bridge (0.59% compared to 0.38%), the ratio of stabilizer to lead paint residue (waste) was greater for KY 185 bridge (1:1.94 compared to 1:0.51), meaning that comparably more stabilizer was used. Makeshift dosing, the effects of the vacuum/recycling and wet stabilizing material all contributed to the failure to obtain stabilized lead paint residue below the RCRA EP-toxicity threshold for both stabilization products. Based on test results the contractor elected not to attempt on site re-treatment and instead disposed of the waste at a TSD facility.

Recycling

Contrasted with the stabilization work, the recycling effort went without incident. The contractor recycled all of the material generated on the KY 10 and KY 3225 bridges at the Doe Run smelter and was issued certificates of recycling for the two projects (Figures 11a and 11b).

Disposal Quantities and Costs

For the US 31E and KY 185 bridges (74,200 ft² painted steel), 39-55 gallon drums of waste were generated weighing 26,200 lbs. The total hazardous waste disposal cost for that waste was about \$7,500 including transportation costs to the contractor. For the KY 101 and KY 3225 bridges (77,800 ft² painted steel), 72-55 gallon drums of hazardous material were recycled weighing 49,375 lbs. The total recycling cost for that material was \$12,428. The cost to KYTC for obtaining hazardous waste permits for the US 31E and KY 185 bridges was \$600 and the generation fee will be \$524 – a total hazardous waste disposal cost of \$1,124. On a per ton basis, the hazardous waste disposal cost KYTC \$658 per ton. Recycling on the KY 101 and KY 3225 bridges cost \$503 per ton. Compared to cost estimates using recyclable equipment in Appendix 2, these estimates do not provide the \$21,500 for vacuum/recycling trailer rental nor the cost for the steel drums (\$60 per). If those were included, the contractor's cost for hazardous waste disposal would increase to \$31,340 and his cost for recycling would increase to \$37,648.

CONCLUSIONS

The recycling portion of the experimental project which was a success; the waste stabilization was a failure. Despite endorsements by both stabilization manufacturers, the use of recycled steel grit and the vacuum/recycling unit caused problems that would probably have been avoided if pre-blended expendable abrasive/stabilizers had been employed. In hindsight, there was not enough knowledge about factors that impacted this stabilization attempt. Stabilizer mixing was inaccurate and wet material fouled one batch. The various waste streams in the vacuum/recycling trailer made final disposition of the stabilizer in the paint residue problematic. Another factor that colored the stabilization treatment results was the sampling method employed. Random grab samples were taken by persons inexperienced in proper sampling techniques. A properly executed sampling plan might have indicated that more of the residue had been properly treated than was indicated by the random tests performed. This highlights the need for the preparation of proper sampling plan and rigid adherence to the sampling/testing protocol.

After the project was completed KTC researchers contacted the vacuum/recycling trailer manufacturer and learned about issues related to attempting to pre-mix the recyclable abrasive and subsequently use the vacuum/recycling unit to process the resulting paint residue. That firm is developing a blending system that can be retrofitted to the firm's vacuum/recycling trailers. It would mix wastes from the various collection points and subsequently dose that waste with stabilizer before it was placed in first waste storage (thereby allowing regulation at a leachable lead threshold of 5 mg/L). This offers a good solution to the problems encountered by KYTC on this project but also limits contractor choice to this equipment. Additional problems affecting the KYTC stabilization effort included proper dosing and wet stabilization chemicals. The other stabilization chemical suppliers must review this effort and develop workable alternatives. One alternative is post-generation treatment to the Universal Test Standard (for leachable lead 0.75 mg/L) after the lead paint residue is collected and mixed. Both of these options eliminate concerns about the effect of the stabilization chemicals on paint adhesion/performance that accompany the use of pre-blended expendable abrasives.

Recycling is the preferable option to dispose of lead paint residue. It meets the KYTC objectives of minimizing waste generation. However, stabilization should be further investigated including products of the two other manufacturers who were not able to participate in an experiment project to validate their products. There is only one firm in the U.S. that will recycle typical lead paint residue. If that firm closes or radically increases prices, other alternatives will be needed. KYTC should conduct further investigative work to identify workable stabilization methods/chemicals that will work with recyclable steel grit. That will dramatically reduce the amount of waste generated (by about a factor of 10) and, once contractors have depreciated their equipment, result in low solid waste disposal costs.

RECOMMENDATIONS

Based upon this experimental project, the following recommendations are provided:

- Recycling is the best option for addressing KYTC goals about reducing both hazardous and solid wastes and should be employed on most future KYTC maintenance painting projects.
- Recyclable steel grit needs to be specified on projects to permit recycling as a commercial substitute.
- Future transport of hazardous materials should be by common or contractor carriers licensed to ship hazardous materials in the states through which the waste is transported.
- KYTC may still need to obtain a conditionally exempt small quantity hazardous waste generator permit to dispose of miscellaneous wastes. Doe Run may be able to accept some or all of those wastes.
- KYTC inspectors must be diligent in preventing co-mingling of wastes with the lead paint residue or the Doe Run smelter will refuse to accept the material for recycling.
- A plan must be provided to deal with that contingency. KYTC is responsible for the material and if it is rejected by Doe Run, it may constitute a hazardous waste.
- Another experimental effort is needed to investigate the use stabilization chemicals with recyclable grit to convert hazardous waste to solid waste for local disposal in a contained landfill. As shown in Cost Estimate 5 of Appendix 2, proper selection of disposal options and successful stabilization treatment can provide an economically viable alternative to recycling or hazardous waste disposal.

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**CURRENT KYTC LEAD-PAINT RESIDUE DISPOSAL PROCESS
(HAZARDOUS WASTE)**

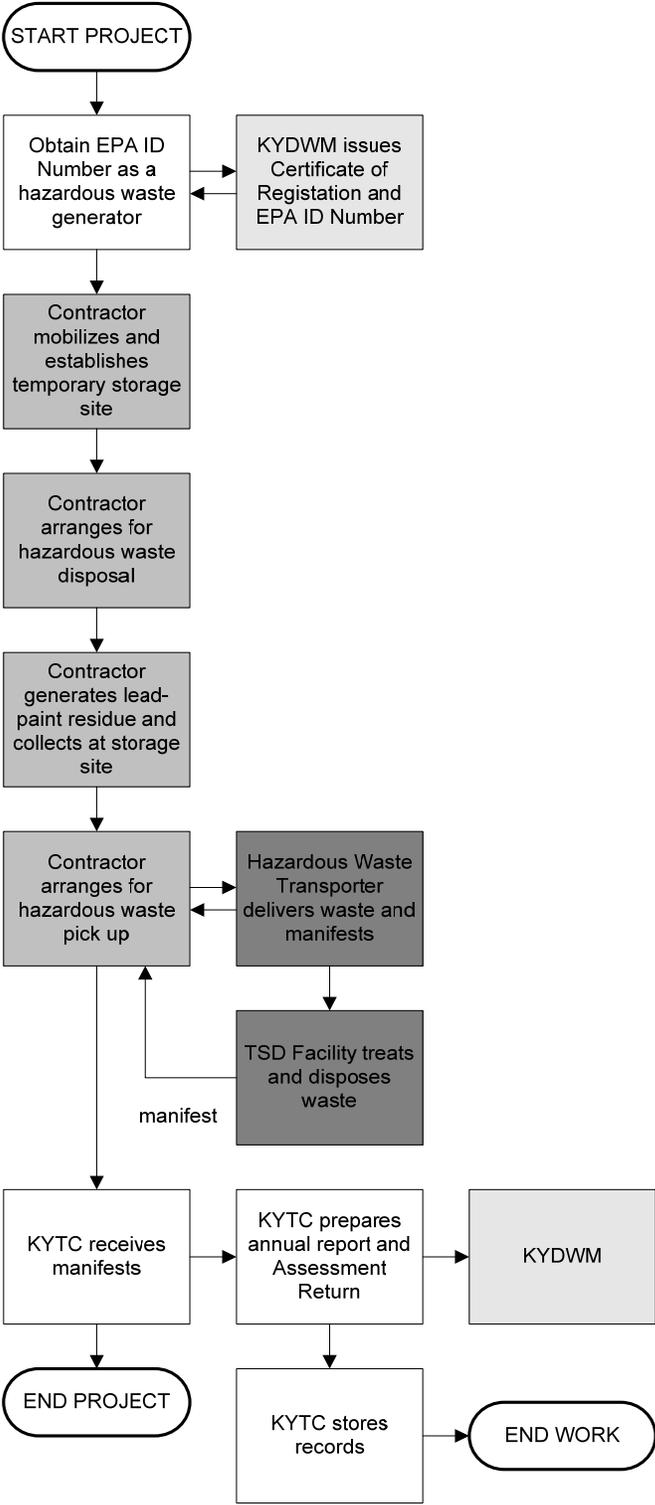


Figure 1. Flowchart for conventional hazardous waste disposal.

EXPERIMENTAL KTYC LEAD-PAINT RESIDUE DISPOSAL PROCESS (SOLID WASTE)

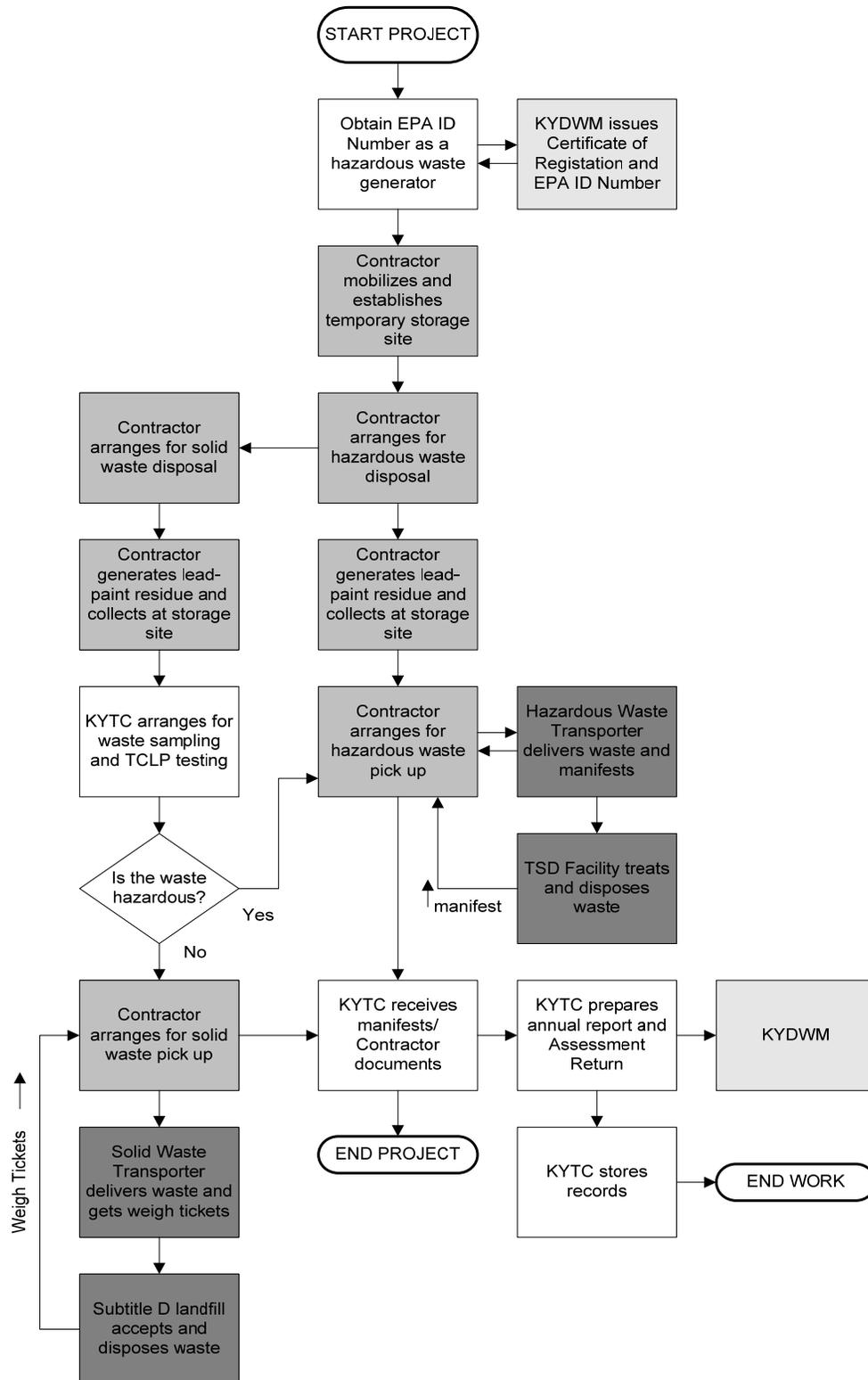


Figure 2. Flowchart of the proposed experimental stabilization process.

EXPERIMENTAL KYTC LEAD-PAINT RESIDUE RECYCLING PROCESS (COMMERCIAL SUBSTITUTE)

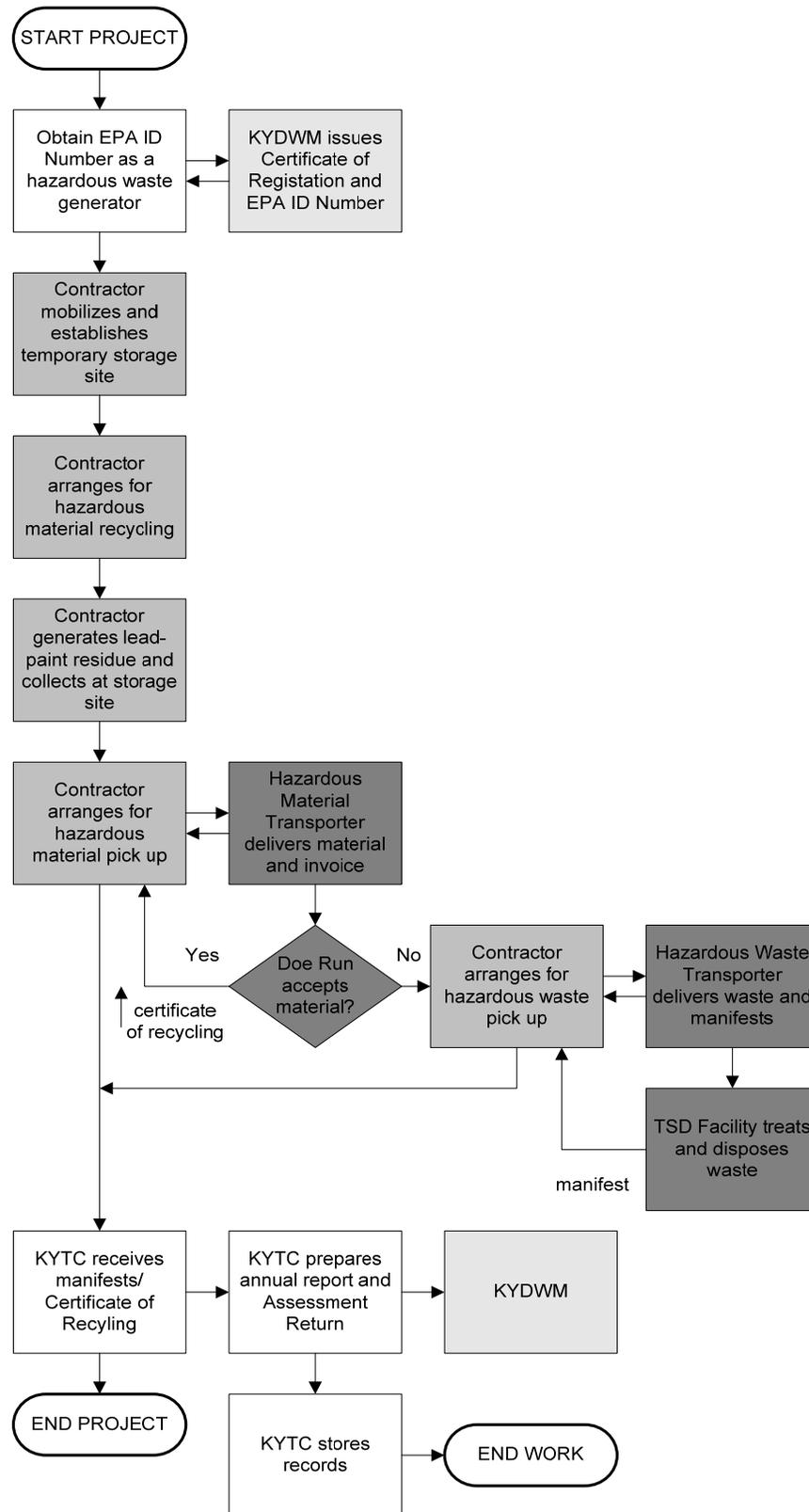


Figure 3. Flowchart of proposed experimental recycling process.



Figure 4. Painting operations on the KY 101 bridge.



Figure 5. Trailer-mounted vacuum/recycling unit on the KY 101 bridge.



Figure 6. Lead paint residue from the KY 101 bridge in temporary storage.



Figure 7. The set up used to charge stabilizer (BLASTOX[®]) into the recycled steel grit bin on the KY 185 bridge.



Figure 8. Choker rope placed around the hole in the stabilizer bag to provide metering of the (BLASTOX[®]) into the recycled steel grit bin.



Figure 9. The similar set up used to charge stabilizer (LEADX[®]) into the recycled steel grit bin on the US 31E bridge



Figure 10. The similar set up used to charge stabilizer (LEADX[®]) into the recycled steel grit bin on the US 31E bridge



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63025-4034
372-626-4812 • FAX: 372-626-3304

Recycling Certificate

Whereas, The Doe Run Company operates a facility, in Boss, Missouri which recycles various lead bearing materials. This facility is operated under regulations provided by the Missouri Department of Natural Resources and the United States Environmental Protection Agency. Operating permit numbers are available upon request. Now, therefore, The Doe Run Company does hereby issue this Certificate of Recycling to:

POSEIDON ENVIRONMENTAL SERVICE to evidence the recycling of:

Order Nbr	PPG-08-0160	PB PAINT GRIT FE RECYCLING FEE	29,695 LB
BOL Nbr	283112		
Ship Doc	KY 3225 BRIDGE		

Said recycling has been completed on or about 6/28/05, in a manner consistent with acceptable engineering standards and in compliance with applicable rules and regulations set forth by the State of Missouri and Federal authorities.

<small>POSEIDON ENVIRONMENTAL SERVICE 837 BOARDMAN-CANFIELD ROAD SUITE 209 BOARDMAN, OH 44512</small>	 <small>The Doe Run Company Management Representative Date: 6/29/05</small>
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(a)



HCL BOX 1365
BOSS, MO
63025-4034
372-626-4812 • FAX: 372-626-3304

Recycling Certificate

Whereas, The Doe Run Company operates a facility, in Boss, Missouri which recycles various lead bearing materials. This facility is operated under regulations provided by the Missouri Department of Natural Resources and the United States Environmental Protection Agency. Operating permit numbers are available upon request. Now, therefore, The Doe Run Company does hereby issue this Certificate of Recycling to:

POSEIDON ENVIRONMENTAL SERVICE to evidence the recycling of:

Order Nbr	PPG-08-0160	PB PAINT GRIT FE RECYCLING FEE	19,680 LB
BOL Nbr	282609		
Ship Doc	WARREN COUNTY		

Said recycling has been completed on or about 6/17/05, in a manner consistent with acceptable engineering standards and in compliance with applicable rules and regulations set forth by the State of Missouri and Federal authorities.

<small>POSEIDON ENVIRONMENTAL SERVICE 837 BOARDMAN-CANFIELD ROAD SUITE 209 BOARDMAN, OH 44512</small>	 <small>The Doe Run Company Management Representative Date: 6/18/05</small>
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(b)

Figure 11. Doe Run certificates of recycling for (a) the KY 3225 bridge and (b) the KY 101 bridge

TABLES

Table 1. Lead-Paint Residue Stabilizers Investigated

Product	Manufacturer	Details/Advantages/Disadvantages	Cost Data
Blastox	The TDJ Group Inc. 760-A Industrial Drive Cary, IL 60013 Phone: 847/639-1113 Contact: James A. Lively	Additive to non-recyclable abrasive blended by abrasive supplier. Typical use 15% by weight of abrasive. Most widely used product for treating paint residue from bridges-proven effectively when properly blended. Cement-like material that should probably be cleaned from bridge if left overnight. Currently, only used with non-recyclable abrasive that yields a large amount of solid waste to be disposed. Effective with lead and cadmium. High chromium values >several 1000 ppm may not be stabilized.	Adds approx. \$110/ton of non-recyclable abrasive (1).
LEADX	RC Global Marketing, Ltd. R1 Box 242-H Reagan, TX 76680 Phone: 254-587-2445 Contact: Carl Huff	Additive to non-recyclable abrasive blended by abrasive supplier. Typical use 20% by weight of abrasive. Good references from sole abrasive distributor on West coast. May create some dust in containment. Can't ship too far as it will segregate from abrasive. Can be used with recyclable or non-recyclable abrasives. Very little experience with first option. Non-recyclable abrasive use yields a large amount of solid waste to be disposed. Effective with most heavy metals encountered in existing bridge coatings.	Adds approx. \$110/ton of non-recyclable abrasive (2).
PreTox 2000FD	NexTec 4050 Westmark Drive Dubuque, IA 52002 Phone: 815/747-2891 Contact: David J. Steffen	Single-component liquid temporary coating applied over existing surface by brush, roll or spray (airless). Dries in less than one hour. Can be used with most common paint removal methods including recyclable abrasives yielding lower amounts of lead-paint residue than non-recyclable abrasives. Has been tested in FHWA study. This product stabilizes lead and chromium. For extremely high chrome concentrations an add-on product is mixed with waste residue.	\$0.35/ft ² coated/blast cleaned. For non-recyclable abrasive this works out to about \$100/ton for non-recyclable abrasive (3). Cost does not include coating application
FESI-BOND PAINT	Forrester Environmental Services Inc. 78 Tracy Way Meredith, NH 03253	Latex-based stabilizer painted on existing surface. Dries in two hours. Can be used with most common paint removal methods including recyclable abrasive (See PreTox Above). Basic technology not widely used on bridges, but widely used in heavy metal remediation projects. Effective with most heavy metals encountered in existing bridge coatings.	\$0.35/ft ² coated/blast cleaned. For non-recyclable abrasive this works out to about \$100/ton for non-recyclable abrasive (4). Cost does not include coating application
FESI-BOND BLAST	03253 Phone: 603/279-3407 Contact: Keith E. Forrester	A dry stabilizer to be blended with recyclable or non-recyclable abrasives. Similar to LEADX. Basic technology not widely used on bridges, but widely used in heavy metal remediation projects. Effective with most heavy metals encountered in existing bridge coatings. Dosage at 2 percent per ton of non-recyclable abrasive.	\$60/ton of non-recyclable abrasive (blended). \$45/ton of residue based upon 80:20 proportion of abrasive to residue (4).
FESI-BOND TREAT	Forrester	A dry or wet material used for on-site treatment in-tank. Can be used with any abrasive or dry removal method. Basic technology not widely used on bridges, but widely used in heavy metal remediation projects. Effective with most heavy metals encountered in existing bridge coatings. Dosages determined by laboratory testing.	Less than \$30/ton of residue (recyclable or non-recyclable abrasive) (4). Cost does not include on-site mixing.

Table 2 - KY185 bridge TCLP values for wastes stabilized with BLASTOX®

Date Sampled	Area Sampled	TCLP (mg/L)
No Stabilizer		
6/17/2005	Air 1	750.0
6/17/2005	Air 2	1.9
6/17/2005	Cyclone	240.0
6/17/2005	Screen	6.9
6/17/2005	Dust Collector	1.7
Transition		
6/18/2005	Air 1	230.0
6/18/2005	Air 2	0.1
6/18/2005	Cyclone	1.0
6/18/2005	Screen	0.5
6/18/2005	Dust Collector	12.0
Stabilized		
6/19/2005	Air 1	0.9
6/19/2005	Air 2	8.2
6/19/2005	Cyclone	2.1
6/19/2005	Screen	2.6
6/19/2005	Dust Collector	18.0
6/20/2005	Air 1	125.0
6/20/2005	Air 2	0.1
6/20/2005	Cyclone	0.2
6/20/2005	Screen	1.3
6/20/2005	Dust Collector	1.5
6/22/2005	Air 1	0.3
6/22/2005	Air 2	<0.1
6/22/2005	Cyclone	2.7
6/22/2005	Screen	<0.1
6/22/2005	Dust Collector	2.0

Table 3 - 31 E bridge TCLP values for wastes stabilized with LEADX®

Date Sampled	Area Sampled	TCLP (mg/L)
No Stabilizer		
7/14/2005	Air 1	<0.1
7/14/2005	Air 2	6.4
7/14/2005	Cyclone	12.0
7/14/2005	Screen	0.2
7/14/2005	Dust Collector	19.0
Transition		
7/15/2005	Air 1	500.0
7/15/2005	Air 2	5.1
7/15/2005	Cyclone	3.7
7/15/2005	Screen	26.0
7/15/2005	Dust Collector	2.1
Stabilized		
7/16/2005	Air 1	32.0
7/16/2005	Air 2	14.0
7/16/2005	Cyclone	26.0
7/16/2005	Screen	6.3
7/16/2005	Dust Collector	1.8
7/17/2005	Air 1	65.0
7/17/2005	Air 2	12.0
7/17/2005	Cyclone	3.1
7/17/2005	Screen	5.0
7/17/2005	Dust Collector	1.2
7/20/2005	Air 1	67.0
7/20/2005	Air 2	33.0
7/20/2005	Cyclone	112.0
7/20/2005	Screen	24.0
7/20/2005	Dust Collector	92.0

Table 4. Use of stabilization chemicals to treat lead paint residue

Location	Product Used (lbs)	Paint Waste (lbs)	Total Waste Generated (lbs)	Paint Waste to Product Ratio
KY 185	8,775 BLASTOX®	4,525	13,300	1.94
31E	4,250 LEADX®	8,350	12,600	0.51

APPENDICES

Appendix 1. Contained (Subtitle D) Landfills in Kentucky that Will Accept Stabilized Lead Paint Residue (October 2004)

County / Permit Number	Facility Address / Facility Mailing Address	Contact Name / Phone Number	Accept Waste/Restrictions	Comments/FAX/Other	Test Requirements
<p>Barren</p> <p>005-00001</p>	<p>Glasgow Regional Landfill 400 Glen Garry Road, Glasgow, KY 42141-0278</p> <p>City of Glasgow, 118 East Washington St., Glasgow, KY 42141-0278</p>	<p>Alvie Morgan 270/678-4302</p>	<p>Adair, Allen, Barren, Clinton, Cumberland, Edmonson, Hardin, Green, Metcalf, Monroe, Warren</p>	<p>Cost \$25-30/ton depending on county. Need to submit waste stream application form. TCLP reviewed by consultant prior to accepting waste (takes 2-3 days).</p>	<p>One test per site.</p>
<p>Boone</p> <p>008-00004</p>	<p>Bavarian Waste Services, 12764 McCoy Fork Road, Walton, KY 41094</p> <p>Bavarian Trucking Landfill, 4837 Madison Pike, Independence, KY 41051</p>	<p>Rick Brueggemann 859/485-4416</p>	<p>Boone, Bracken, Campbell, Carroll, Fayette, Gallatin, Grant, Harrison, Kenton, Mason, Nicholas, Owen, Pendleton, Scott</p>	<p>Cost approx. \$22/ton depending on waste TCLP and volume. Need to submit waste stream application form. TCLP reviewed by consultant prior to accepting waste (usually takes 1 day). Can pick up waste from job site for approved waste-cost averages \$150/haul.</p>	<p>One test per site.</p>

<p>Boyd</p> <p>010-000-4</p>	<p>Cooksey Brothers Disposal Company Incorporated Landfill, 401 North Big Run Road, Ashland, KY 41102</p> <p>Cooksey Brothers Disposal Co. Inc., 15400 Ellington Run, Ashland, KY 41102</p>	<p>John Poore Mick Stephens 606/928-9633</p>	<p>Boyd, Anderson, Bath, Bell, Boone, Bourdon, Boyle, Bracken, Breathitt, Caldwell, Campbell, Carroll, Carter, Casey, Clark, Clay, Elliott, Estill, Fayette, Fleming, Floyd, Franklin, Fulton, Gallatin, Garrard, Grant, Graves, Grayson, Green, Greenup, Harlan, Harrison, Hart, Henry, Jackson, Jefferson, Jessamine, Johnson, Kenton, Knott, Knox, Laurel, Lawrence, Lee, Leslie, Letcher, Lewis, Lincoln, Livingston, Logan, McCreary, Madison, Magoffin, Marion, Marshall, Martin, Mason, Menifee, Mercer, Montgomery, Morgan, Nicholas, Oldham, Owen, Owsley, Pendleton, Perry, Pike, Powell, Pulaski, Robertson, Rockcastle, Rowan, Scott, Shelby, Spencer, Trigg, Warren, Washington, Wayne, Whitley, Wolfe, Woodford</p>	<p>Cost approx. \$35/ton. Need to submit TCLP, MSDS, and manifest. Takes approx. 1 month to pick up waste.</p>	<p>One test per site.</p>
<p>Daviess</p> <p>030-00004</p>	<p>West Daviess County Landfill, 7772 KY 815, West Louisville, KY 42377-9429</p> <p>Daviess County Fiscal Court, 212 Saint Ann St., Room 202, Owensboro, KY 42303</p>	<p>Rob Hocker 270/229-4484</p>	<p>All counties in Kentucky</p>	<p>FAX-270/229-4490 Cost approx \$20/ton depending on waste. Need to submit waste stream application form and TCLP. Can accept waste shortly after receiving information. Will accept manifested waste.</p>	<p>One test per site.</p>

Estill	Blue Ridge Recycling & Disposal Facility, 2700 Winchester Road, Irvine, KY 40336	Rob Bramlett 606/723-5552	Adair, Anderson, Bath, Bell, Boone, Bourbon, Boyd, Bracken, Boyle, Breathitt, Campbell, Carroll, Carter, Casey, Clark, Clay, Clinton, Cumberland, Estill, Elliott, Fayette, Fleming, Floyd, Franklin, Gallatin, Garrard, Grant, Green, Greenup, Harlan, Harrison, Henry, Jackson, Jessamine, Johnson, Kenton, Knott, Knox, Laurel, Lawrence, Lee, Leslie, Letcher, Lewis, Lincoln, Madison, Magoffin, Marion, Martin, Mason, McCreary, Menifee, Mercer, Montgomery, Morgan, Nelson, Nicholas, Owen, Owsley, Pendleton, Perry, Pike, Powell, Pulaski, Robertson, Rockcastle, Rowan, Russell, Scott, Shelby, Spencer, Taylor, Washington, Wayne, Whitley, Wolfe, Woodford	Cost \$28/ton. Need to submit generator profile, proper analytical, and manifest. Takes 1-2 weeks to accept waste. Can pick up waste from job site for \$175-\$225/haul & \$7/ton/mile.	One test per site.
033-00004	Waste Management of KY, LLC, 7501 Grade Lane, Louisville, KY 40219-3440				
Franklin	Benson Valley Area Landfill, 2157 Highway 151, Frankfort, KY 40601	Danny Rosilio 502/227-7257	All counties in Kentucky	Cost \$15/yd3 or \$42/ton whichever is greater. Need to submit analytical profile, manifest, and special waste profile. Takes 1 day to accept waste.	No test required
037-00009	BFI Waste Systems of North America Inc., 2157 Highway 151, Frankfort, KY 40601				
Grant	Epperson Waste Disposal, 117 Kell Road, Williamstown, KY 41097	Jeff Perry 859/223-3824	Anderson, Bath, Boone, Bourbon, Boyd, Boyle, Bracken, Breathitt, Bullitt, Campbell, Carroll, Carter, Casey, Clark, Elliott, Estill, Fayette, Fleming, Franklin, Gallatin, Garrard, Grant, Greenup, Hardin, Harrison, Henry, Jackson, Jefferson, Jessamine, Kenton, Larue, Laurel, Lawrence, Lee, Lewis, Lincoln, Madison, Magoffin, Marion, Mason, Meade, Menifee, Mercer, Montgomery, Morgan,	Cost \$32.50/ton. Need to submit TCLP and special waste application. Takes 1 day to accept waste.	One test required per site.

041-00004	Republic Industries Inc., 2343 Alexandria Drive, Suite 400, Lexington, KY 40504		Nelson, Nicholas, Oldham, Owen, Owsley, Pendleton, Powell, Pulaski, Robertson, Rockcastle, Rowan, Scott, Shelby, Spencer, Taylor, Trimble, Washington, Wolfe, Woodford		
Graves	West Kentucky Landfill, Environmental Corporation Landfill, 1500 North Big Run Road, Ashland, KY 41102	Mike Hext 270/247-1049	All counties in Kentucky	Cost \$67/drum or \$23/yd3 per roll off. Takes 1 - 2 days to accept waste. Need to submit generator's waste profile sheet, copy of TCLP, and service agreement.	One test per site required as long as it is representative of the site.
042-00007	Jones Sanitation LLC, 3426 KY 45 South, Mayfield, KY 42066				
Greenup	Green Valley, Environmental Corporation, Landfill, 1500 North Big Run Road, Ashland, KY 41102	Scott Rawn 606/928-2039	Bath, Boyd, Breathitt, Carter, Elliott, Fleming, Floyd, Greenup, Johnson, Knott, Lawrence, Letcher, Lewis, Magoffin, Martin, Menifee, Morgan, Perry, Pike, Rowan, Wolfe	Cost \$23.75/ton. Need to submit TCLP, MSDS for blast media used, MSDS for additive, profile form, and manifest with each load.	One test required per site
045-00012	Republic Industries, Inc., 2343 Alexandria Drive, Suite 400, Lexington, KY 40504				

Hardin	Hardin Co. Fiscal Court, Landfill, 1620 Audubon Trace, Elizabethtown, KY 42701	George Ayres 270/769-2951	Adair, Anderson, Barren, Boyle, Breckinridge, Bullitt, Butler, Casey, Carroll, Daviess, Edmonson, Franklin, Fayette, Green, Hancock, Hardin, Hart, Henry, Jefferson, Larue, Lincoln, Allen, Marion, Meade, Mercer, Metcalf, Grayson, Nelson, Ohio, Oldham, Russell, Shelby, Taylor, Trimble, Warren, Washington, Woodford	Cost \$23.84/ton. Need to submit waste characterization data sheet. Takes 1 - 2 days to accept waste.	Only one test required if material is the same.
047-00040	Hardin County Fiscal Court, Courthouse, 14 Public Square, Elizabethtown, KY 42701-1436				
Jefferson	Waste Management of KY, LLC, 2673 Outer Loop Road, Louisville, KY 40219	Mike Hext 502/966-0272	All counties in Kentucky	Cost \$67/drum or \$23/yd3 per roll off. Takes 1 - 2 days to accept waste. Need to submit generator's waste profile sheet, copy of TCLP, and service agreement.	One test per site required as long as it is representative of the site.
056-00028	Waste Management of KY, LLC, 7501 Grade Lane, Louisville, KY 40219-3440				
Laurel	Laurel Ridge Landfill, Inc., 552 Hopper Road, Lily, KY 40219	Mike Hext 606/864-4391	All counties in Kentucky	Cost \$67/drum or \$23/yd3 per roll off. Takes 1 - 2 days to accept waste. Need to submit generator's waste profile sheet, copy of TCLP, and service agreement.	One test per site required as long as it is representative of the site.
063-00003	Laurel Ridge Landfill, LLC, PO Box 1364, Corbin, KY 40702				
Lincoln	Tri K Landfill, Inc., 1905 KY Highway 3249, PO Box 435, Stanford, KY 40484	Jeff Perry 606/365-7806	Adair, Anderson, Barren, Bell, Boyle, Breathitt, Bullitt, Casey, Clark, Clay, Clinton, Cumberland, Estill, Fayette, Franklin, Garrard, Green, Hardin, Harlan, Hart, Jackson, Jefferson, Jessamine, Knox, Larue, Lee, Leslie, Lincoln, Madison, Marion, McCreary, Mercer, Metcalfe, Monroe, Nelson, Owsley, Perry, Powell, Pulaski, Rockcastle, Russell, Scott, Shelby, Spencer, Taylor, Washington, Wayne, Whitley, Wolfe,	Cost \$32.50/ton. Need to submit TCLP and special waste application. Takes 1 day to accept waste.	One test required per site.
069-00004	Republic Industries, Inc., 2343 Alexandria Drive, Suite 400, Lexington, KY				

	40504		Woodford		
Logan	Southern Sanitation, Landfill, 478 Cooperstown Road, Russellville, KY 42276	Mike Hext 270/726-9016	All counties in Kentucky	Cost \$67/drum or \$23/yd3 per roll off. Takes 1 - 2 days to accept waste. Need to submit generator's waste profile sheet, copy of TCLP, and service agreement.	One test per site required as long as it is representative of the site.
071-00006	LWD Sanitary Landfill Inc., Post Office Box 37, Russellville, KY 42276-0537				
Marshall	LWD Sanitary Landfill, Inc., Old Coke Plant Road, Calvert City, KY 42029-0327	270/395-5313		OUT OF BUSINESS	
079-00015	LWD Sanitary Landfill Inc., Post Office Box 327, Calvert City, KY 42029-0327				
Mason	Maysville/Mason County, Landfill, 7055 Clarkson-Sherman, Road, Maysville, KY 4106	Robert DeVoe 606/759-7049	Mason, Fleming, Lewis, Bracken, Robertson, Nicholas, Bourbon	Cost \$20/ton. Need to submit special waste form. (approx. 6 pages)	One test per shipment or roll off as long as it is representative of the site.
081-00006	Mason County Fiscal Court, 219 Stanley Reed Court, Maysville, KY 41056				
Montgomery	Rumpke of Kentucky, Montgomery County, Landfill, 30 Dump Road/30 Lairson Road, Jeffersonville, KY 40353	Brian Burgemeir 859/498-6798	Anderson, Bath, Bourbon, Boyd, Boyle, Breathitt, Carter, Casey, Clark, Clay, Elliott, Estill, Fayette, Fleming, Floyd, Franklin, Garrard, Greenup, Hardin, Harrison, Jefferson, Jessamine, Jackson, Johnson,	Cost \$23.84/ton. Need to submit waste characterization data sheet. Takes 1 - 2 days to accept waste.	Only one test required if material is the same.

087-00003	Rumpke of Kentucky Inc., 10795 Highes Road, Cincinnati, OH 45251		Knott, Laurel, Lawrence, Lee, Leslie, Letcher, Lewis, Lincoln, Madison, Magoffin, Martin, Mason, Menifee, Mercer, Montgomery, Morgan, Nicholas, Owsley, Perry, Pike, Powell, Pulaski, Robertson, Rockcastle, Rowan, Scott, Wolfe, Woodford		
Nelson	Nelson County Landfill, 1025 Airport Road, Bardstown, KY 40004	Brad Spalding 502/348-1877	Nelson, Marion	Cost Nelson Co. - \$8/yd ³ . Marion Co. - \$8.40/yd ³ . Need application to accept a waste stream (7 pages). Takes one day to accept waste.	One test per roll off
090-00001	Nelson County Landfill, 1025 Airport Road, Bardstown, KY 40004				
Ohio	Ohio County Balefill, Landfill, 100 Landfill Lane, Beaver Dam, KY 42320	Phyllis Holinde 270/298-7501	All counties in Kentucky	Cost \$28/ton. Need to submit special waste profile, special waste service agreement, proper analytical, and chain of custody. Takes 24 hrs to accept waste.	Need three composite samples If less than 100 yd ³ . One additional test for every 500 yd ³ .
092-00010	Ohio County Fiscal Court, PO Box 87, Hartford, KY 42347				
Pendleton	Rumpke of Kentucky, Pendleton County Landfill, Bryant-Griffin Road, Butler, KY 41006	Brian Burgemeir 859/472-7339	Boone, Bourbon, Bracken, Campbell, Carroll, Fayette, Grant, Gallatin, Harrison, Henry, Jefferson, Kenton, Lewis, Mason, Nicholas, Owen, Pendleton, Robertson, Scott, Trimble	Cost \$23.84/ton. Need to submit waste characterization data sheet. Takes 1 - 2 days to accept waste.	Only one test required if material is the same.
096-00001	Rumpke of Kentucky Inc., 10795 Hughes Road, Cincinnati, OH 45251				

Pike	Pike County Landfill, Route 119, Pikeville, KY 41502	Glenn Childers 606/631-4629	Floyd, Johnson, Knott, Lawrence, Letcher, Magoffin, Perry, Pike, Martin	Cost \$33.50/ton. Need to submit TCLP. Takes 24 hrs to accept waste.	One test per roll off
098-00014	Pike County Fiscal Court, PO Box 1229, Pikeville, KY 41501				
Rowan	Local Sanitation of Rowan, County, 300 Old Phelps Road, Morehead, KY 40351-0484	Rob Bramlett 606/784-6544	Rowan, Adair, Allen, Anderson, Barren, Bath, Bell, Boone, Bourbon, Boyd, Boyle, Bracken, Breathitt, Bullitt, Campbell, Carroll, Carter, Casey, Clark, Clay, Clinton, Edmonson, Elliott, Estill, Fayette, Fleming, Floyd, Franklin, Gallatin, Garrard, Grant, Green, Greenup, Hardin, Harlan, Harrison, Hart, Henry, Jackson, Jefferson, Jessamine, Johnson, Kenton, Knott, Knox, Larue, Laurel, Lawrence, Lee, Leslie, Letcher, Lewis, Lincoln, McCreary, Madison, Magoffin, Marion, Martin, Mason, Menifee, Mercer, Metcalfe, Monroe, Montgomery, Morgan, Nelson, Nicholas, Oldham, Owen, Owsley, Pendleton, Perry, Pike, Powell, Pulaski, Robertson, Rockcastle, Russell, Scott, Shelby, Spencer, Taylor, Trimble, Warren, Washington, Wayne, Whitley, Wolfe, Woodford	Cost \$28/ton. Need to submit generator profile, proper analytical, and manifest. Takes 1-2 weeks to accept waste. Can pick up waste from job site for \$175-\$225/haul & \$7/ton/mile.	One test per site.
103-00007	Local Sanitation of Rowan , County Inc., 2340 Morrisville Highway, Lewisburg, KY 37091				
Spencer	Williams Landfill, 4876 Kings Church Road, Taylorville, KY 40071	502/239-2117		Inactive	
108-00002	Williams Landfill, 4876 Kings Church Road, Taylorsville, KY 40071				

Trimble	Valley View Landfill, Highway 157, Sulphur, KY 40070				
112-00002	Republic Industries of KY, , LLC, 2343 Alexandria Drive, Suite 400, Lexington, KY 40504	Jeff Perry 502/743-5426	All counties in Kentucky	Cost \$32.50/ton. Need to submit TCLP and special waste application. Takes 1 day to accept waste.	One test required per site.
Union	Dozit Company Inc., Landfill, 4075 State Route 30, Morganfield, KY 42437				
113-00005	Republic Industries Inc., 2343 Alexandria Drive, Suite 400, Lexington, KY 40504	Phyllis Holinde 270/822-4289	All counties in Kentucky	Cost \$28/ton. Need to submit special waste profile, special waste service agreement, proper analytical, and chain of custody. Takes 24 hrs to accept waste.	Need three composite samples If less than 100 yd ³ . One additional test for every 500 yd ³ .
Whitley	Tri-County Sanitary Landfill, Post Office Box 1364, Williams Hollow Road, Corbin, KY 40702				
118-00010	Tri-County Sanitary Landfill, LLC, Post Office Box 1364, Corbin, KY 40702	606/523-9565		Inactive	

Appendix 2. Cost Estimates for Various Methods of Lead Paint Residue Disposal/ Recycling

1. Estimated Cost of Hazardous Waste Disposal of Lead Paint Residue Generated Using Recyclable Steel Grit

Assume:

Bridge area painted = 50,000 ft²

Weight of existing paint = 2 to 5 tons: Use 5 tons including mill scale

Recycled Abrasive Use/Cost/Loss: (Contractor 1)/[Contractor 2]

(Contractor 1) - (24 drums @ 1 ton/drum x \$500/ton abrasive = \$12,000)

(loss = 4 tons = \$2,000)

[Contractor 2] - [20 drums @ 1 ton/drum x \$800/ton abrasive = \$16,000]

[loss = 3 tons = \$2,400]: Use 4 tons loss and \$2,400 cost

Waste Generated: (Contractor 1)/[Contractor 2]/{Recent KYTC Project}

(25 drums)/[15-20 drums]/{56 drums for 70,000 ft² project: est. 40 drums for 50,000 ft² project}

Range 15 to 40 drums: Use 30 drums

Assume shipping weight of 600 lb/drum. Total shipping weight = 30 drums x 600 lb/drum = 18,000 lb.

Hazardous Waste Disposal Cost from TSD Facility:

= \$1,275 (freight)* + \$92.20/drum (disposal)* x 30 drums + 30 drums x \$60/drum = \$5,841

Generation/Disposal Cost to Contractor:

= \$5,841 (disposal) + \$2,400 (lost abrasive) + \$21,500 (recycling equipment**) = \$29,741

= \$29,741

Per Ton Total Generation/Disposal Cost to Contractor:

= \$29,741/8 tons waste generated = \$3,718/ton

KYTC Costs:

EPPC Hazardous Waste Generator Regis. (1 Waste Stream per Project) = \$300

EPPC Hazardous Waste Generator Fee (18,000 lb x \$0.002) = 36

TOTAL \$336

Total Disposal Cost to KYTC Neglecting Contractor Profit:

Generation/Disposal Cost to Contractor = \$29,741

EPPC Hazardous Waste Processing Costs = 336

TOTAL \$30,077

* Prices quoted by TSD firm

** Price from equipment manufacturer for 1-month (minimum) rental on a medium capacity recycling machine/trailer

2. Estimated Cost of Hazardous Waste Disposal of Lead Paint Residue Using Expendable Abrasives

Assume:

Bridge area painted = 50,000 ft²
Weight of existing paint = 5 tons (from Cost Estimate 1)

For Expendable Abrasives:

Amount of Blast Media Required = 50,000 ft² x 5 lb abrasive/ ft² x 1 ton/2000 lb. = 125 tons.
Cost of Abrasive = 125 tons x \$85/ton* = \$10,625

Assume use of Roll-off:

Total On-site Cost = \$205 (Spot Fee) + \$110 (10-day Rental) + \$35 (Liner) = \$350

Hazardous Waste Disposal Cost from TSD facility (17-ton cap. Roll-off):

Total Hazardous Waste = 5 tons (residue) + 125 tons (abrasive) = 130 tons
Number of Roll-offs/Hauls Required = 130/17 = 7.6 ~ 8 trips
Total Disposal Cost = \$1,275 x 8 (freight)** + \$75/ton (disposal) ** x 130 tons + \$350 (Roll-off Site Fee)** x 8 = \$22,750

Generation/Disposal Cost to Contractor:

= \$22,750 (disposal) + \$10,625 (abrasive) + \$6,000 (3 blast pots***) = \$39,375

Per Ton Total Generation/Disposal Cost to Contractor:

= \$39,375/130 tons waste generated ~ \$303/ton

KYTC Costs:

EPPC Hazardous Waste Generator Regis. (1 Waste Stream per Project)	= \$300
EPPC Hazardous Waste Generator Fee (260,000 lb x \$0.002)	= <u>520</u>
TOTAL	\$820

Total Disposal Cost to KYTC Neglecting Contractor Profit:

Generation/Disposal Cost to Contractor =	\$39,375
EPPC Hazardous Waste Processing Costs =	<u>820</u>
TOTAL	\$40,195

* Price from abrasive supplier for coarse abrasive in bulk containers.

** Price from TSD facility

*** Price from equipment manufacturer for 1-month (minimum) rental on three blast pots

3. Estimated Cost of Solid Waste Disposal of In-Situ Stabilized Lead Paint Residue Using Pre-Blended Expendable Abrasives

Assume:

Bridge area painted = 50,000 ft²

Weight of existing paint = 5 tons (from Cost Estimate 1)

For Non-recyclable Abrasives:

Amount of Blast Media Required = 50,000 ft² x 5 lb abrasive/ ft² x 1 ton/2000 lb. = 125 tons.

Blended Material used on Project = 125 tons x 1.15 tons ~ 144 tons

Cost of Blended Material + 144 tons x \$165/ton* = \$23,760

Assume use of Roll-off:

Total On-site Cost = \$205 (Spot Fee) + \$110 (10-day Rental) + \$35 (Liner) = \$350

Solid Waste Disposal Cost (17-ton cap. Roll-off):

Total Solid Waste = 5 tons (residue) + 144 tons (abrasive) = 149 tons

Number of Roll-offs/Hauls Required = 149/17 = 8.8 ~ 9 trips

Total Disposal Cost = \$150** x 9(freight) + \$25/ton** (disposal) x 149 tons + \$350 (Roll-off Site Fee)*** x 9 = \$8,225

Total Disposal Cost:

= \$8,225 (disposal) + \$23,760 (abrasive and stabilizer) = \$31,985

Generation/Disposal Cost to Contractor:

= \$8,225 (disposal) + \$23,760 (abrasive and stabilizer) + \$6,000 (3 blast pots****) = \$37,985

Per Ton Total Generation/Disposal Cost to Contractor:

= \$37,985/149 tons waste generated ~ \$255/ton

Total Disposal Cost to KYTC Neglecting Contractor Profit:

Generation/Disposal Cost to Contractor = TOTAL \$39,375

* Price from abrasive supplier/stabilizer blender for coarse abrasive blended with Blastox in bulk container.

** Estimated solid waste hauling and disposal costs based upon conversations with various contained landfill owners in Kentucky.

*** Price from TSD facility

**** Price from equipment manufacturer for 1-month (minimum) rental on three blast pots

4. Estimated Cost of Hazardous Material Recycling of Lead-Paint Residue

Assume:

Bridge area painted = 50,000 ft²

Weight of existing paint = 5 tons (from Cost Estimate 1)

For Recycled Abrasives: (Contractor 1)/[Contractor 2]

(24 drums @ 1 ton/drum x \$500/ton abrasive = \$12,000)

(loss = 4 tons = \$2,000)

[20 drums @ 1 ton/drum x \$800/ton abrasive = \$16,000]

[loss = 3 tons = \$2,400]

Waste Generated: Use 30 barrels (from Cost Estimate 1)

Assume shipping weight of 600 lb/drum. Total shipping weight = 30 drums x 600 lb/drum = 18,000 lb.

Hazardous Material Recycling Cost from Doe Run Smelter (Galena, MO)

= \$650* (freight) + \$135/drum* (disposal) x 30 + 30 drums x \$60/drum = \$6,500

Total Generation/Recycling Cost to Contractor:

= \$6,500 (disposal) + \$2,400 (abrasive) + \$21,500 (recycling equipment**)

= \$30,400

Per Ton Total Generation/Recycling Cost to Contractor:

= \$30,400/8 tons material generated = \$3,800/ton

Total Recycling Cost to KYTC Neglecting Contractor Profit:

Generation/Recycling Cost to Contractor = TOTAL \$30,400

* Cost estimate from Doe Run Lead Smelter

** Price from equipment manufacturer for 1-month (minimum) rental on a medium capacity recycling machine/trailer

5. Estimated Cost of Solid Waste Disposal of In-Situ Stabilized Lead Paint Residue Using Site Applied Stabilizer with Recyclable Abrasives (Prepared after Project)

Assume:

Bridge Area Painted = 50,000 ft²

Weight of Existing Paint and Mill Scale Removed = 5 tons (from Cost Estimate 1)

Recycled Abrasive Loss/Cost:

Loss = 4 tons/ \$2,400 (See Cost Estimate 1.)

Stabilization Chemical Use for Recyclable Abrasives:

Amount of Stabilizer Required = 3 tons*

Cost of Stabilizer = \$5,000*

Solid Waste Disposal Cost (17-ton cap. Roll-off):

Total Solid Waste = 12 tons (See Cost Estimate 1.)

Number of Hauls Required = 1 Trip

Total Disposal Cost = \$150** x 1 (freight) + \$25/ton** (disposal) x 12 tons + \$350 (Roll-off Site Fee)*** x 1 = \$800

Total Generation/Disposal Cost to Contractor:

= \$800 (disposal) + \$5,000 (stabilization chemical) + \$2,400 (lost abrasive) + \$21,500 (recycling equipment****)

= \$29,675

Per Ton Total Generation/Disposal Cost to Contractor:

= \$29,675/12 tons waste generated = \$2,473/ton

Total Disposal Cost to KYTC Neglecting Contractor Profit:

Generation/Disposal Cost to Contractor =

TOTAL \$29,675

* Estimated cost of stabilizer chemical

* Estimated solid waste hauling and disposal costs based upon conversations with various contained landfill owners in Kentucky.

*** Price from TSD facility

**** Price from equipment manufacturer for 1-month (minimum) rental on a medium capacity recycling machine/trailer

Appendix 3. Special Notes for Stabilization and Recycling Project in the Bowling Green Area

SPECIAL NOTE FOR SURFACE PREPARATION RESIDUE MANAGEMENT FOR FE02 0002 031E B00007 – ALLEN COUNTY

Surface preparation at this bridge involves the use of an experimental additive introduced into the abrasive with the purpose of rendering the surface preparation waste non-hazardous. In order to evaluate the effectiveness of this process, a portion of the structure (*standard process area*) will be abrasive blasted (see **SPECIAL NOTE FOR SURFACE PREPARATION AND PAINT APPLICATION**) without the experimental additive. The balance of the bridge steel (experimental process area) will be abrasive blasted incorporating the experimental additive. Surface preparation of the *standard process area* will be completed before the *experimental process area*. The *standard process area* will comprise approximately 2,000 ft² of the total area of the bridge. All waste collection, handling, transportation, and disposal are the responsibility of the contractor.

Use of the experimental additives for this project DOES NOT reduce or obviate any worker safety regulations. Have a “Competent Person for lead abatement” as defined by OSHA 1926.62 on site during any operations which disturb lead. The “competent person” will have successfully completed the SSPC C3 “Supervisor/Competent Person Training for Deleading of Industrial Structures” or equivalent training.

Abrasive media – standard process area

Use clean, dry, uniformly graded mineral slag abrasives for blast cleaning that are free of oil, soluble salts and other similar substances which could contaminate the blasted surface.

Abrasive media – experimental area

Use clean, dry, uniformly graded mineral slag abrasives for blast cleaning that are free of oil, soluble salts and other similar substances which could contaminate the blasted surface. Provide abrasives that are blended with the experimental additive LEADX[®] in a suitable proportion to produce surface preparation wastes with Toxicity Leaching Procedure Test (TCLP) values less than 5 mg/l per U.S. Environmental Protection Agency Publication SW-846, *Test Methods for Evaluating Solid Waste*. The mix proportion (LEADX[®] to abrasive) must be as recommended by the LEADX[®] supplier, RC Global Marketing, Ltd., Rte 1, Box 242-H Reagan, TX, phone (254) 587-2445, FAX (254) 299-0910, and email leadx@leadx.org.

Temporary storage - *standard process area*

All waste produced during surface preparation of the *standard process area* will be handled, stored, transported, and disposed of as a hazardous waste (see **D. COLLECTION, HANDLING, STORAGE, TRANSPORT AND DISPOSAL OF HAZARDOUS AND INDUSTRIAL WASTES** of the **SPECIAL NOTE FOR SURFACE PREPARATION AND PAINT APPLICATION**). The storage area for this hazardous waste will be appropriately marked and kept separate from the area designated for the *experimental area* surface preparation waste.

Temporary storage – *experimental area*

All waste produced during surface preparation of the experimental area will be handled, stored, transported, and disposed of as an industrial waste. All waste will be collected at least daily and placed in appropriate containers. The contractors’ QC inspector will notify the Engineer when the waste is collected. A temporary storage site will be identified by the contractor and approved by the Engineer. The temporary storage site may be on Department right-of-way or on private property. If the temporary storage site is on private property, the contractor must obtain a “**consent and release agreement**” with the property owner. Store the waste in a

secure location. The Engineer will make a waste determination within 5 working days after notification of collection of waste. The Engineer will inform the contractor whether the subject material is an industrial waste or a hazardous waste and provide him with TCLP test results. If the waste determination should indicate a hazardous waste, the contractor will handle, store, transport and dispose of the waste as a hazardous waste at no additional cost to the Cabinet. Otherwise, the contractor will handle, store, transport and dispose of the waste as an industrial waste.

Precautions are to be taken to protect employees and the public from exposure to lead. Handling and storage of surface preparation debris are to be accomplished to prevent releases to the environment.

Transportation/disposal of industrial waste produced from the experimental area

The contractor will select a registered municipal solid waste transporter for transportation of the industrial waste and a licensed contained (Subtitle D) landfill capable of accepting industrial waste for disposal. The contractor will provide the necessary storage/transportation containers or obtain them from the municipal solid waste transporter. The contractor will prepare any waste-related documentation required by the landfill. The contractor is responsible for all collection, storage, transportation, and disposal of industrial waste. The contractor will supply the Engineer with all landfill weight tickets for surface preparation waste disposed as industrial waste. Additionally, he will provide the Engineer with all costs related to LEADX/abrasive purchases, waste containers (drop fees and demurrage), waste transport, and waste disposal. Final partial payment of 15% for the project will not be released until the Engineer receives those documents.

SPECIAL NOTE FOR SURFACE PREPARATION WASTE MANAGEMENT FOR FE02 0016 0185 B00023 – BUTLER COUNTY

Surface preparation at this bridge involves the use of an experimental additive introduced into the abrasive with the purpose of rendering the surface preparation waste non-hazardous. In order to evaluate the effectiveness of this process, a portion of the structure (*standard process area*) will be abrasive blasted (see **SPECIAL NOTE FOR SURFACE PREPARATION AND PAINT APPLICATION**) without the experimental additive. The balance of the bridge steel (experimental process area) will be abrasive blasted incorporating the experimental additive. Surface preparation of the *standard process area* will be completed before the *experimental process area*. The *standard process area* will comprise approximately 2,000 ft² of the total area of the bridge. All waste collection, handling, transportation, and disposal are the responsibility of the contractor.

Use of the experimental additives for this project DOES NOT reduce or obviate any worker safety regulations. Have a “Competent Person for lead abatement” as defined by OSHA 1926.62 on site during any operations which disturb lead. The “competent person” will have successfully completed the SSPC C3 “Supervisor/Competent Person Training for Deleading of Industrial Structures” or equivalent training.

Abrasive media – standard process area

Use clean, dry, uniformly graded mineral slag abrasives for blast cleaning that are free of oil, soluble salts and other similar substances which could contaminate the blasted surface.

Abrasive media – experimental area

Use clean, dry, uniformly graded mineral slag abrasives for blast cleaning that are free of oil, soluble salts and other similar substances which could contaminate the blasted surface. Provide abrasives that are blended with the experimental additive BLASTOX[®] in a suitable proportion to produce surface preparation wastes with Toxicity Leaching Procedure Test (TCLP) values less than 5 mg/l per U.S. Environmental Protection Agency Publication SW-846, *Test Methods for Evaluating Solid Waste*. The mix proportion (BLASTOX[®] to abrasive)

must be as recommended by the BLASTOX[®] supplier, The TDJ Group, Inc., 760-A Industrial Drive, Cary, IL 600013, phone (847) 639-1113, FAX (847) 639-0499, and email tdj@blastox.com.

Temporary storage - *standard process area*

All waste produced during surface preparation of the *standard process area* will be handled, stored, transported, and disposed of as a hazardous waste (see **D. COLLECTION, HANDLING, STORAGE, TRANSPORT AND DISPOSAL OF HAZARDOUS AND INDUSTRIAL WASTES** of the **SPECIAL NOTE FOR SURFACE PREPARATION AND PAINT APPLICATION**). The storage area for this hazardous waste will be appropriately marked and kept separate from the area designated for the *experimental area* surface preparation waste.

Temporary storage – *experimental area*

All waste produced during surface preparation of the experimental area will be handled, stored, transported, and disposed of as an industrial waste. All waste will be collected at least daily and placed in appropriate containers. The contractors' QC inspector will notify the Engineer when the waste is collected. A temporary storage site will be identified by the contractor and approved by the Engineer. The temporary storage site may be on Department right-of-way or on private property. If the temporary storage site is on private property, the contractor must obtain a “**consent and release agreement**” with the property owner. Store the waste in a secure location. The Engineer will make a waste determination within 5 working days after notification of collection of waste. The Engineer will inform the contractor whether the subject material is an industrial waste or a hazardous waste and provide him with TCLP test results. If the waste determination should indicate a hazardous waste, the contractor will handle, store, transport and dispose of the waste as a hazardous waste at no additional cost to the Cabinet. Otherwise, the contractor will handle, store, transport and dispose of the waste as an industrial waste.

Precautions are to be taken to protect employees and the public from exposure to lead. Handling and storage of surface preparation debris are to be accomplished to prevent releases to the environment.

Transportation/disposal of industrial waste produced from the experimental area

The contractor will select a registered municipal solid waste transporter for transportation of the industrial waste and a licensed contained (Subtitle D) landfill capable of accepting industrial waste for disposal. The contractor will provide the necessary storage/transportation containers or obtain them from the municipal solid waste transporter. The contractor will prepare any waste-related documentation required by the landfill. The contractor is responsible for all collection, storage, transportation, and disposal of industrial waste. The contractor will supply the Engineer with all landfill weight tickets for surface preparation waste disposed as industrial waste. Additionally, he will provide the Engineer with all costs related to LEADX/abrasive purchases, waste containers (drop fees and demurrage), waste transport, and waste disposal. Final partial payment of 15% for the project will not be released until the Engineer receives those documents.

***SPECIAL NOTE FOR SURFACE PREPARATION DEBRIS MANAGEMENT FOR FE02 0114
3225 B00007 and FE02 0114 0101 B00009 – WARREN COUNTY***

The surface preparation debris generated at these bridges will be transported and recycled as a commercial substitute material in a recycling effort. All waste/debris collection, handling, storage, transportation, and disposal are the responsibility of the contractor.

Abrasive media

Use clean, dry, uniformly graded recyclable steel grit abrasives for blast cleaning that are free of oil, soluble salts and other similar substances which could contaminate the blasted surface.

Collection, Handling, and Storage of Wastes and Surface Preparation Debris

Have a “Competent Person for lead abatement” as defined by OSHA 1926.62 on site during any operations which disturb lead. The “competent person” will have successfully completed the SSPC C3 “Supervisor/Competent Person Training for Deleading of Industrial Structures” or equivalent training.

All surface preparation debris are to be collected separate from waste materials and placed in appropriate containers on a daily basis. (See **SPECIAL NOTE FOR ENVIRONMENTAL AND WORKER SAFETY REGULATIONS**).

Surface preparation debris

Surface preparation debris are to be separated from all wastes. While on-site, the surface preparation debris are to be managed as lead containing material. Precautions are to be taken to protect employees and the public from exposure to lead. Handling and storage of surface preparation debris are to be accomplished to prevent releases to the environment.

The Department will provide a site on its property for the Contractor to erect a temporary storage facility. Store surface preparation debris and hazardous wastes at that site, in a secured six-foot high chain-link fence enclosure. The enclosure shall be built in accordance with Standard Drawing No. RFC-001-07 of the Kentucky Department of Highways Standard Drawings Book, with the **exception that concrete is not required for installation of posts**. The fence of the storage area must be firmly attached to metal posts and have a locked gate. The gate must be secured to the fence post by a chain and a lock. Each side of the enclosure is to have appropriate placarding forbidding unauthorized entrance and announcing that the area is a storage site for lead and hazardous wastes. Cover the ground where the containers will be stored with a waterproof tarpaulin. The contractor shall maintain the tarpaulin to avoid tears or punctures. Drums will be set on skids that are placed on the tarpaulin. There must be adequate aisle space between the rows of stored drums so that the drums and labels can be inspected at any time. Areas around roll off containers will be covered with tarpaulins. Tarpaulins are to be cleaned daily to remove collected lead bearing debris. The storage area is to be maintained/operated to prevent releases. The storage area must have a spill clean-up kit. The kit must include, but not be limited to shovel, broom, dustpan and absorbent material for solvents. There must be access to communications or alarms whenever authorized personnel are in the storage compound.

The designated temporary storage facility must be constructed and accepted by the Engineer prior to the onset of operations at the job site. Maintain the temporary storage facility during the active cleaning and painting of the bridge and return the site to its original state when the work is completed.

The Contractor is solely responsible for the management and the disposal of all surface preparation debris and hazardous waste generated during the cleaning and painting operations. Hazardous wastes are to be managed in accordance with the Kentucky Revised Statutes, Chapter 224, Subchapter 46, and the Kentucky Administrative Regulations.

The Contractor is responsible for furnishing appropriate U.S. DOT-specified containers that are made or lined with materials that are compatible with the surface preparation debris per 49CFR173.213 (non-bulk containers) or 49CFR173.240 (bulk containers). All surface preparation debris collected at the job site will be placed in those containers for transport to the storage site. Prior to the transfer of the containers of surface preparation debris from the job site to the storage area, the containers will be correctly sealed, labeled, marked and placarded as defined in the pre-transport requirements of 49CFR172.301 (non-bulk containers) or

49CFR172.302 (bulk containers). The Contractor must check with the recycler and the transporter to insure that containers acceptable to both parties are employed.

The Contractor is responsible for the quality of the surface preparation debris placed in disposal containers. Under NO circumstances should that debris become wet or be co-mingled with miscellaneous wastes.

Transportation and recycling

All surface preparation debris will be transported for recycling within 60 days of initial container filling operations. The contractor will contact the recycler to arrange for the delivery of the surface preparation debris. The recycler is: The Doe Run Company: Resource Recycling Division, HC1 Box 1395, HWY 10K, Boss, MO 65440, phone (573) 626-4813, fax (573) 626-3304, email www.doerun.com. The contractor will complete the Doe Run Supplier Profile Form and provide copies of it to both Doe Run and the Engineer prior to transporting the surface preparation debris.

The contractor will select a registered hazardous material (HAZMAT) transporter for transportation of the surface preparation debris. The contractor will provide the necessary waste storage/transportation containers. The contractor will arrange for the pick-up of the containers and delivery to the recycler.

NOTE: The contractor is responsible for the condition of the surface preparation debris provided to the recycler. Surface preparation debris that is wet debris or that is co-mingled with other waste will be rejected by the recycler. If that occurs, the contractor must dispose of the debris as a hazardous waste. The contractor must promptly inform the Engineer in that event so that KYTC can obtain the proper permitting from the Kentucky Environmental and Public Protection Cabinet. Additionally, the contractor will be responsible for all transportation costs, hazardous waste disposal costs and fines that are incurred.

The contractor will supply the Engineer with all weight tickets for the commercial substitute material transported and delivered to the recycler and all Certificates of Recycling issued by the recycler for material deliveries related to this project. Final partial payment of 15% for the project will not be released until the Engineer receives those documents.